eDNA Biomonitoring in Galveston Bay

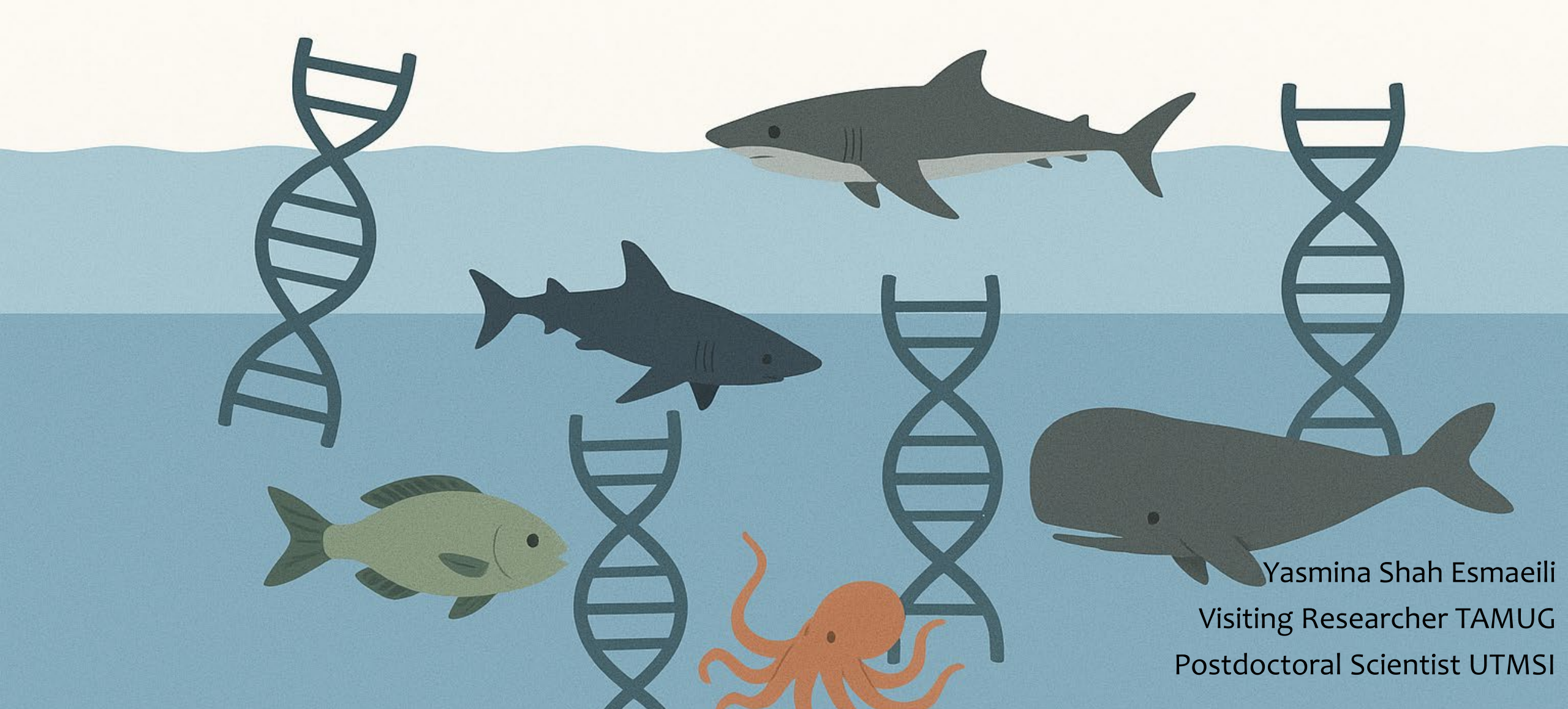
- **Dr. Yasmina Shah Esmaeili** - Invisible traces, big discoveries: Using eDNA to map marine biodiversity (30 minutes)
- **Jaelyn Rodriguez** - The Gulf eDNA Network: a budding collaborative for eDNA research in the Gulf (30 minutes)
- **Dr. Guilherme Corte** - Hidden Life on Texas Shores: Using eDNA to Reveal Coastal Biodiversity (20 minutes)
- **Panel discussion** (10 minutes)


CRIME SCENE DO NOT CROSS


CSI:MIAMI

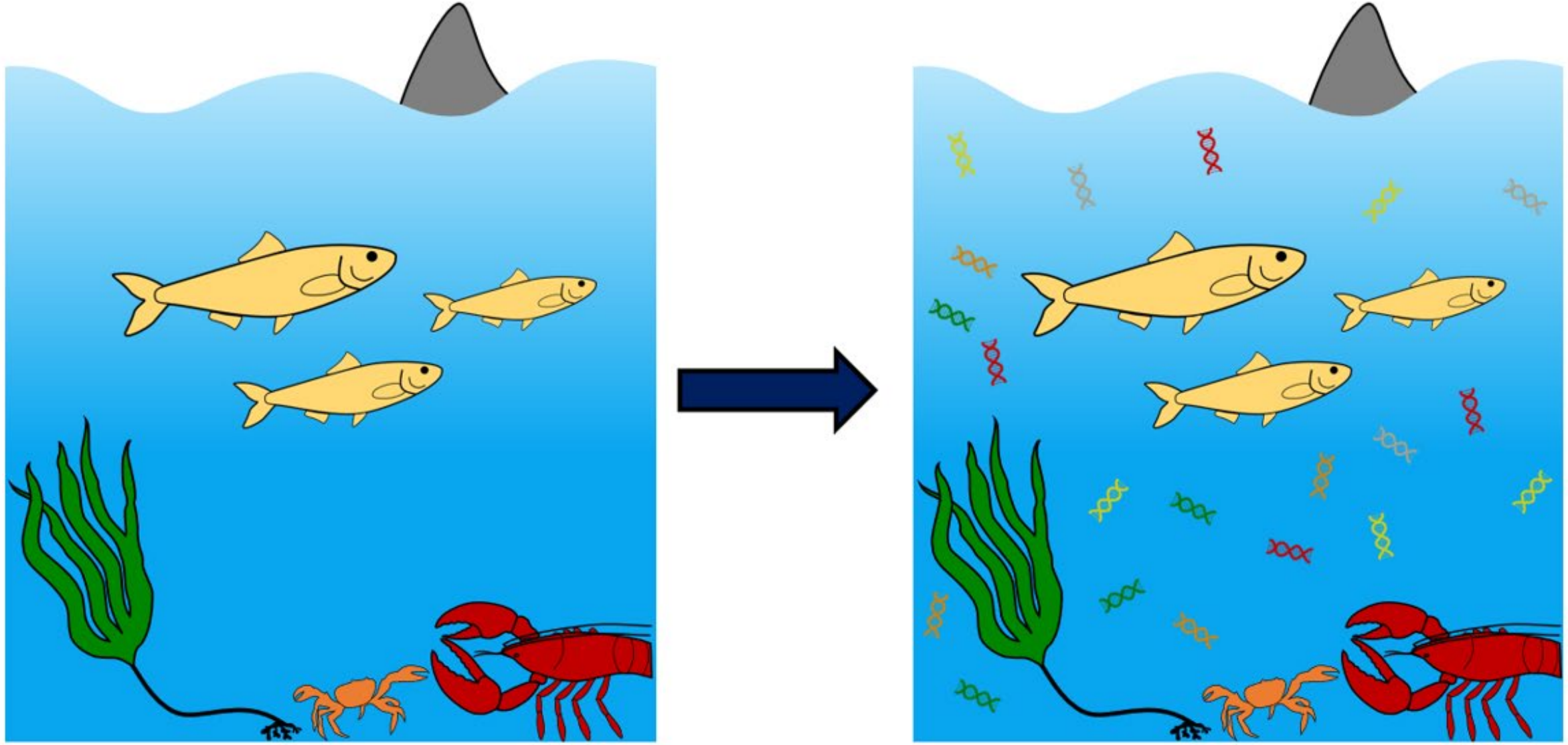

YES, I KNOW I'VE GOTTEN HAIR ALL OVER THE COUCH...
IT'S CALLED 'FUR'NITURE, ISN'T IT?

Invisible traces, big discoveries: Using eDNA to map marine biodiversity

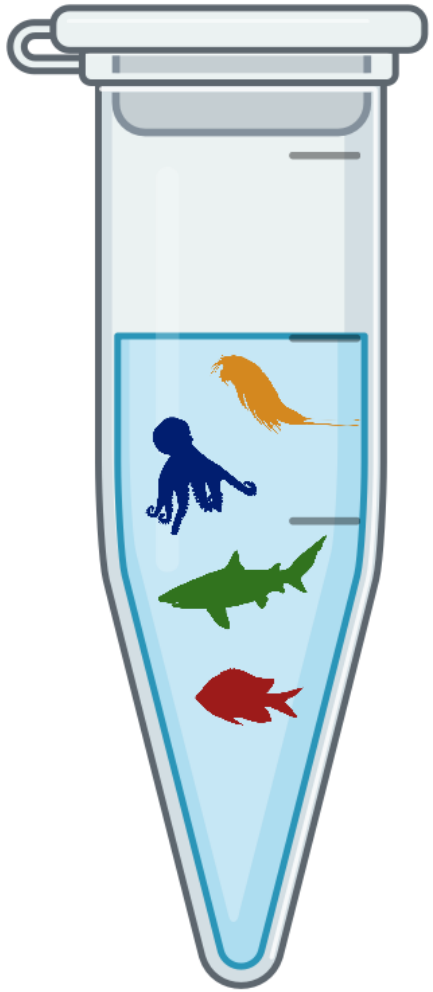


Yasmina Shah Esmaeili
Visiting Researcher TAMUG
Postdoctoral Scientist UTMSI

Using eDNA to assess biodiversity



DNA SOUP!



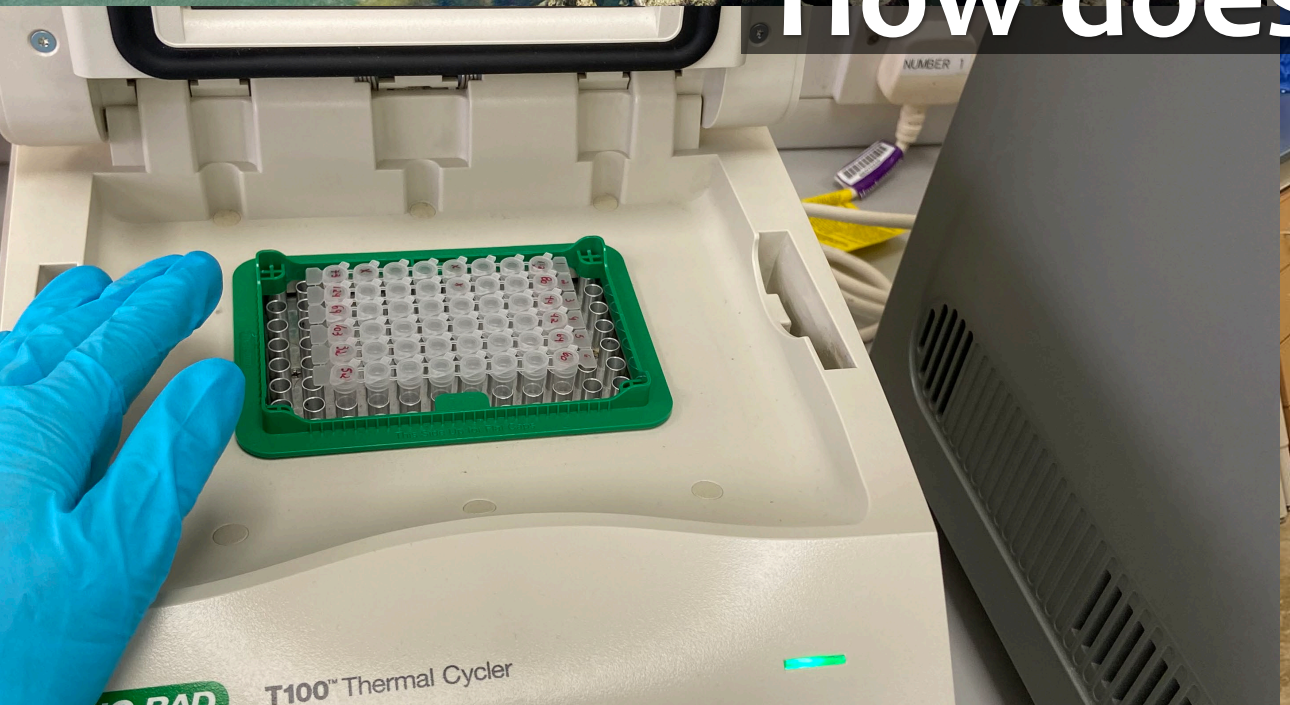
What about everything you can’t see?

Photos: Frank Baensch

eDNA advantages

- Non-invasive method
- Sensible to capture low abundance species
- Powerful to identify rare and endangered species
- Large scale monitoring

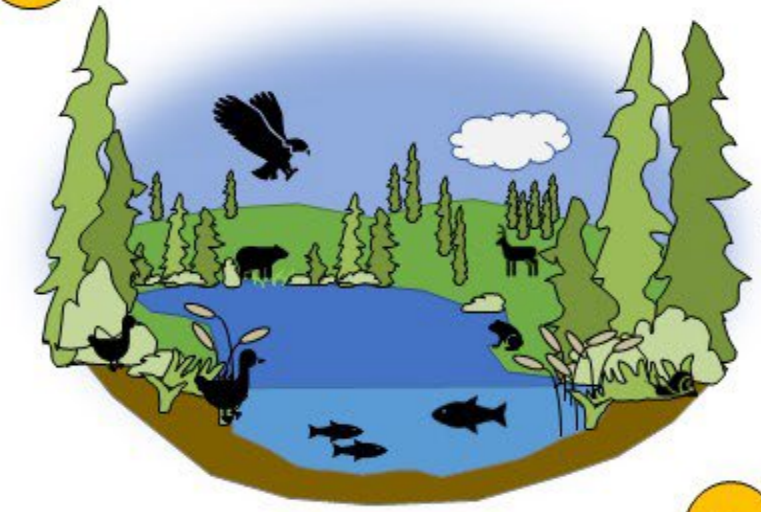
How does it work?




DNA

Xie et al. 2018

1 DNA released to the environment



DNA sequences are unique

2 Collect the sample

From water

3 Extract DNA

From sediment

4 Amplify it

Thermal Cycler

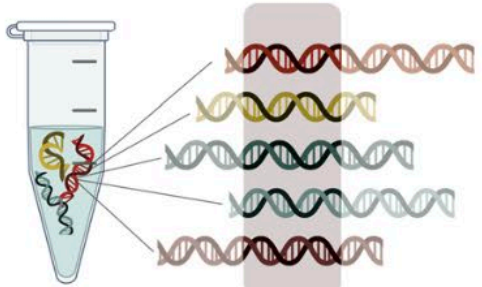
5 Sequence it

NextSeq 5000 DNA Sequencer

6 Species ID

eDNA barcoding and bioinformatics

1 Amplification



DNA sample

Barcode (e.g., 16S)

Polymerase chain reaction (PCR)

multiple copies of barcode region (amplicons)

2 Sequencing & Bioinformatics

Amplicon sequencing

Read 1 TGTCGAGTGACTACTAGCTTAGCT...
Read 2 TGTCGAGTGACTGATAGATAGCTT...
Read 3 TGTCGAGTGACTGATTCATACATT...
...

Bioinformatics

	Sample 1	Sample 2	Sample 3	
ASV 1	143	281	302	
ASV 2	78	101	67	...
ASV 3	0	28	0	
		...		

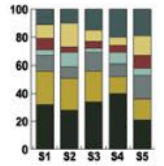
Feature table: count data of ASVs* (or OTUs**)

3 Data Analysis

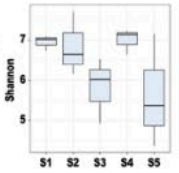
	Sample 1	Sample 2	Sample 3	
ASV 1	143	281	302	
ASV 2	78	101	67	...
ASV 3	45	28	0	
		...		

Feature table

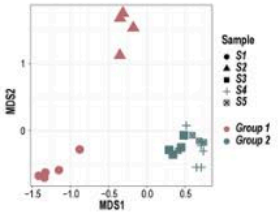
Taxonomic identification



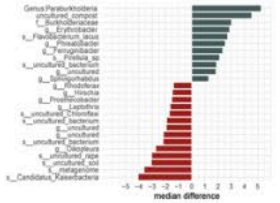
Alpha diversity



Beta diversity



Differential abundances



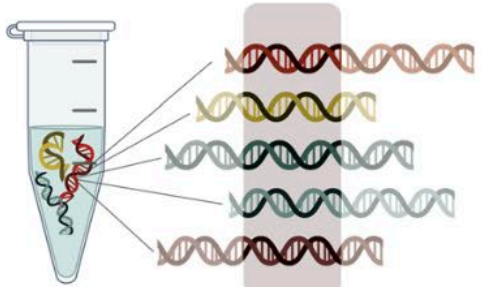
Network analysis, functional diversity prediction, etc.

* *Amplicon Sequencing Variants (ASVs):* biological sequences in the sample prior to the introduction of amplification and sequencing errors.
** *Operational Taxonomic Units (OTUs):* clusters of reads that differ by less than a fixed sequence dissimilarity threshold, most commonly 3%.

Esser et al. 2024

1

Amplification



DNA sample

Barcode (e.g., 16S)

Polymerase chain reaction (PCR)

multiple copies of barcode region (amplicons)

2

Sequencing & Bioinformatics

Read 1
Read 2
Read 3

ASV 1	143	281	302	
ASV 2	78	101	67	...
ASV 3	0	28	0	
		...		

Feature table: count data of ASVs* (or OTUs**)

3

Data Analysis

Network analysis, functional diversity prediction, etc.

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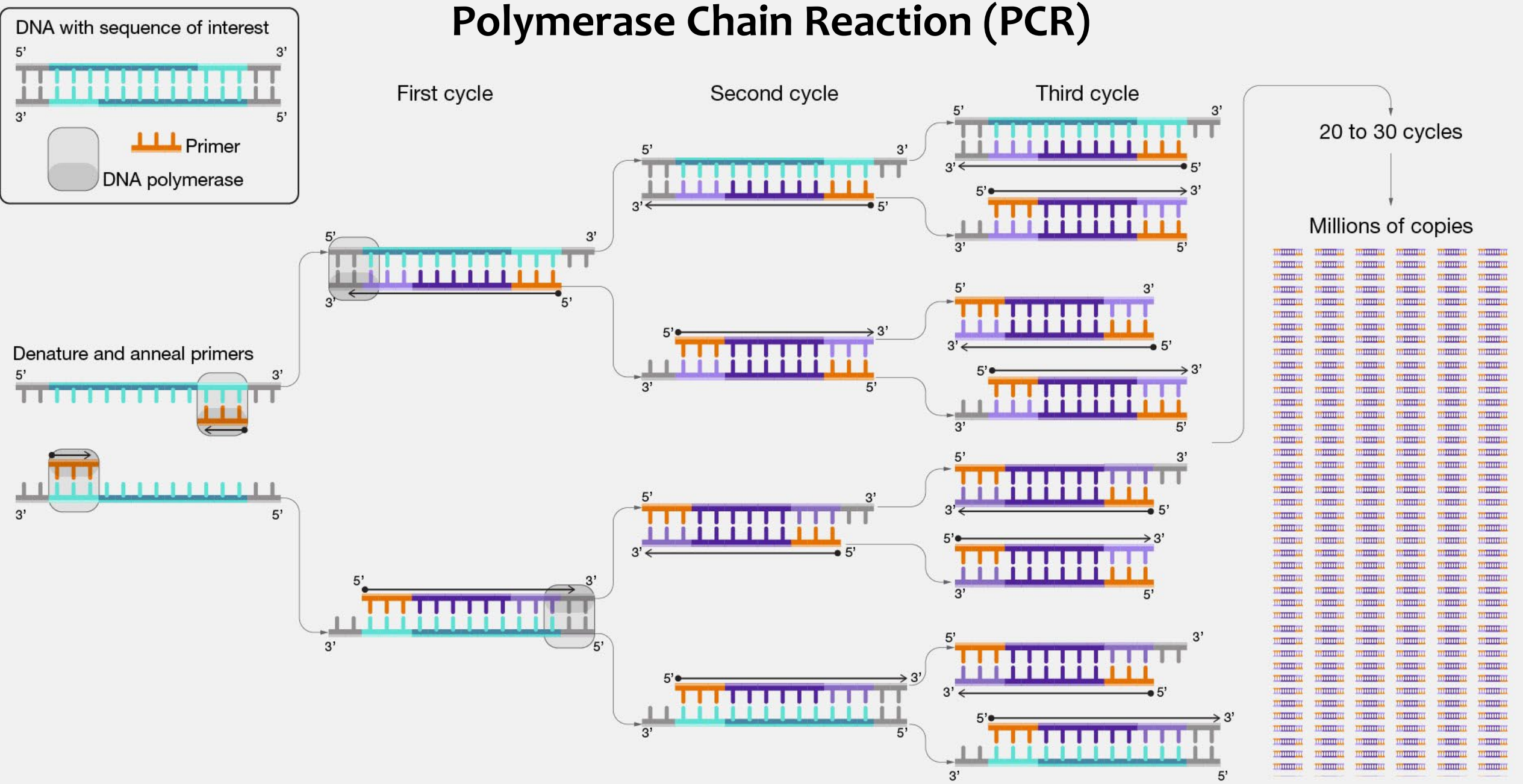
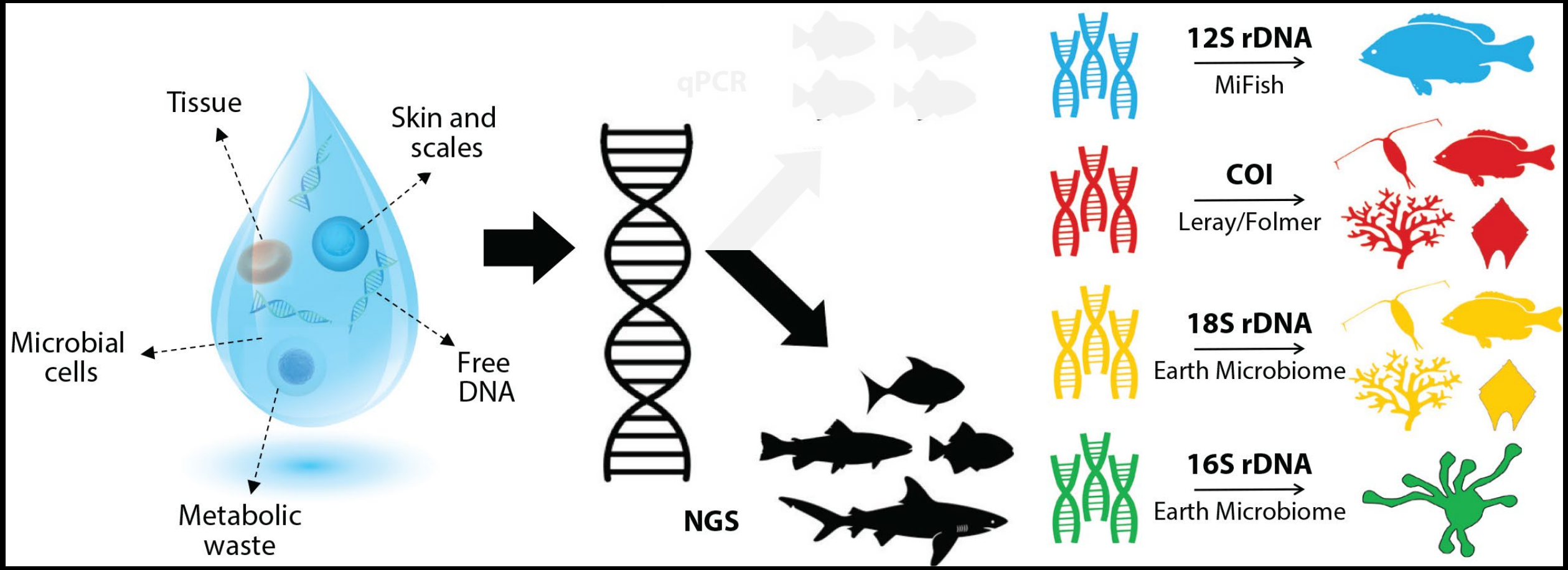
Esser et al. 2024

Polymerase Chain Reaction (PCR)

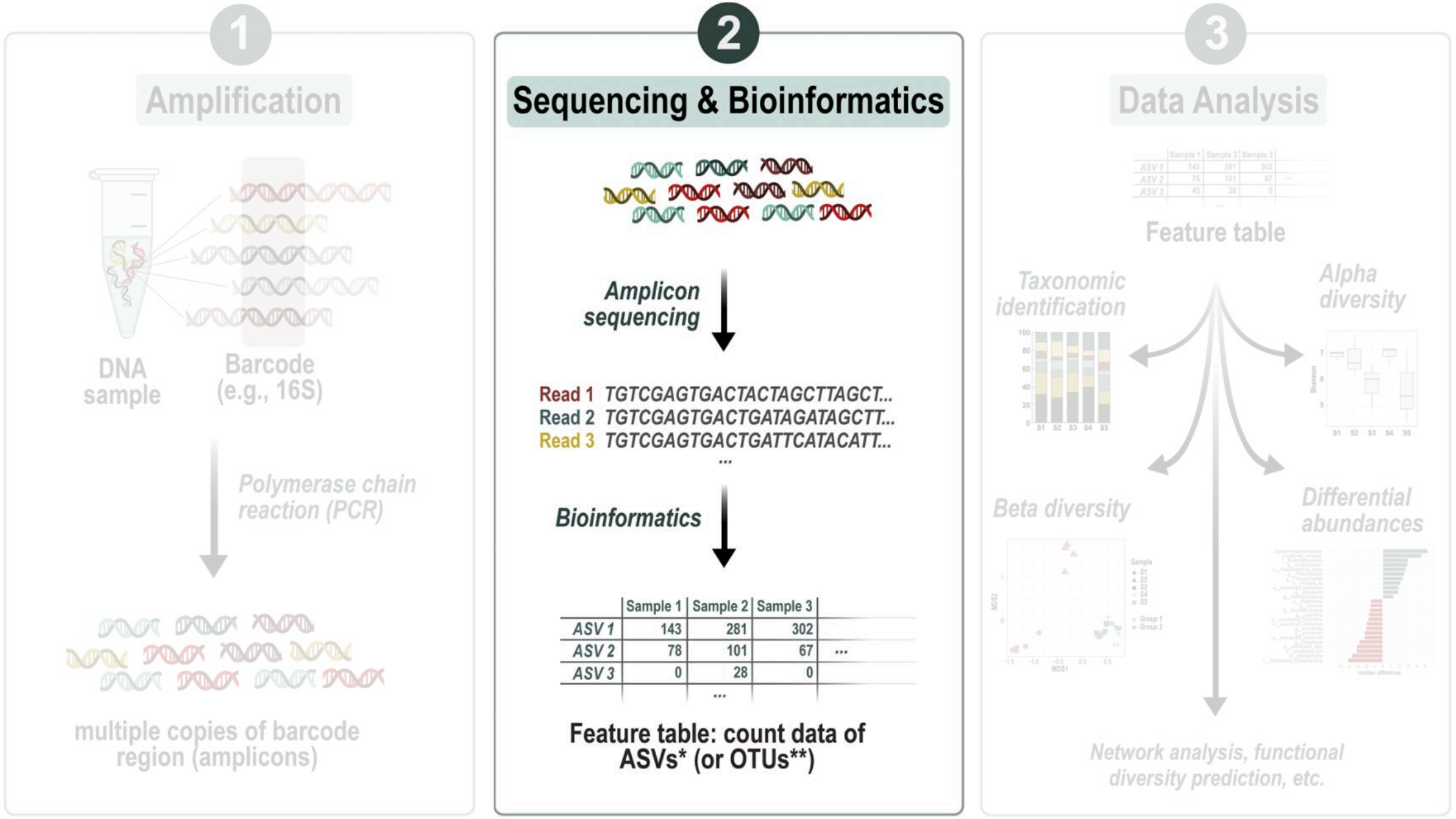


Esser et al. 2024

Environmental DNA metabarcoding



Chavez et al. 2021



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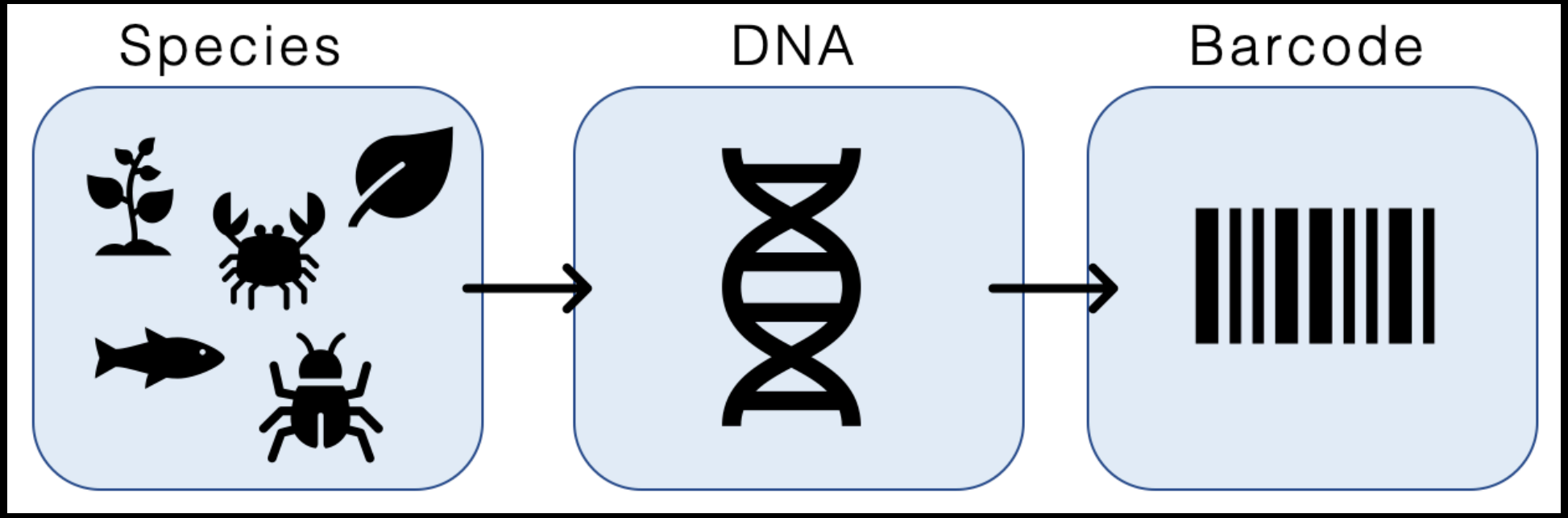
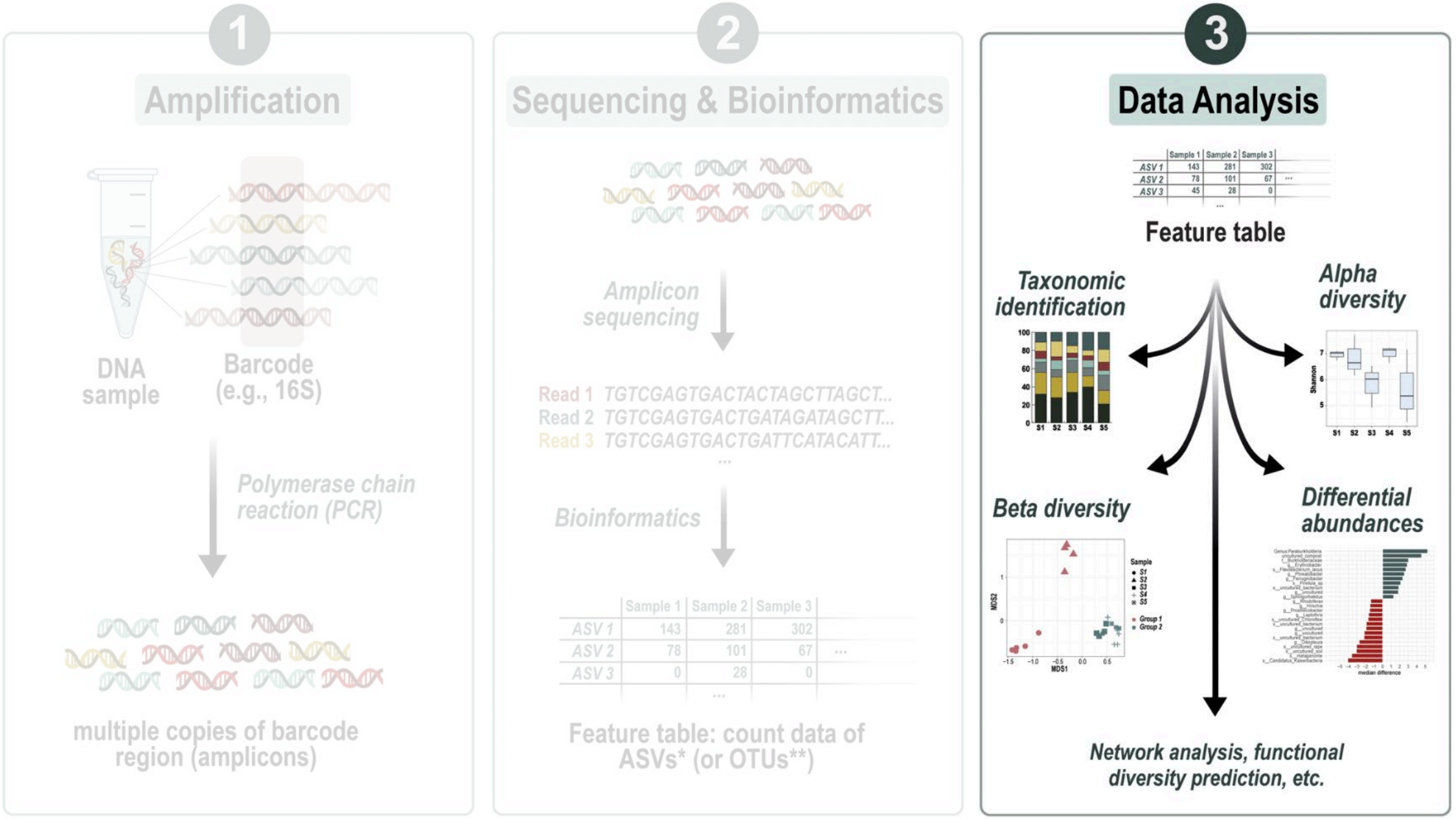
Esser et al. 2024

A **reference database** is like a **dictionary of known DNA sequences** linked to known species



No match ≠ no species



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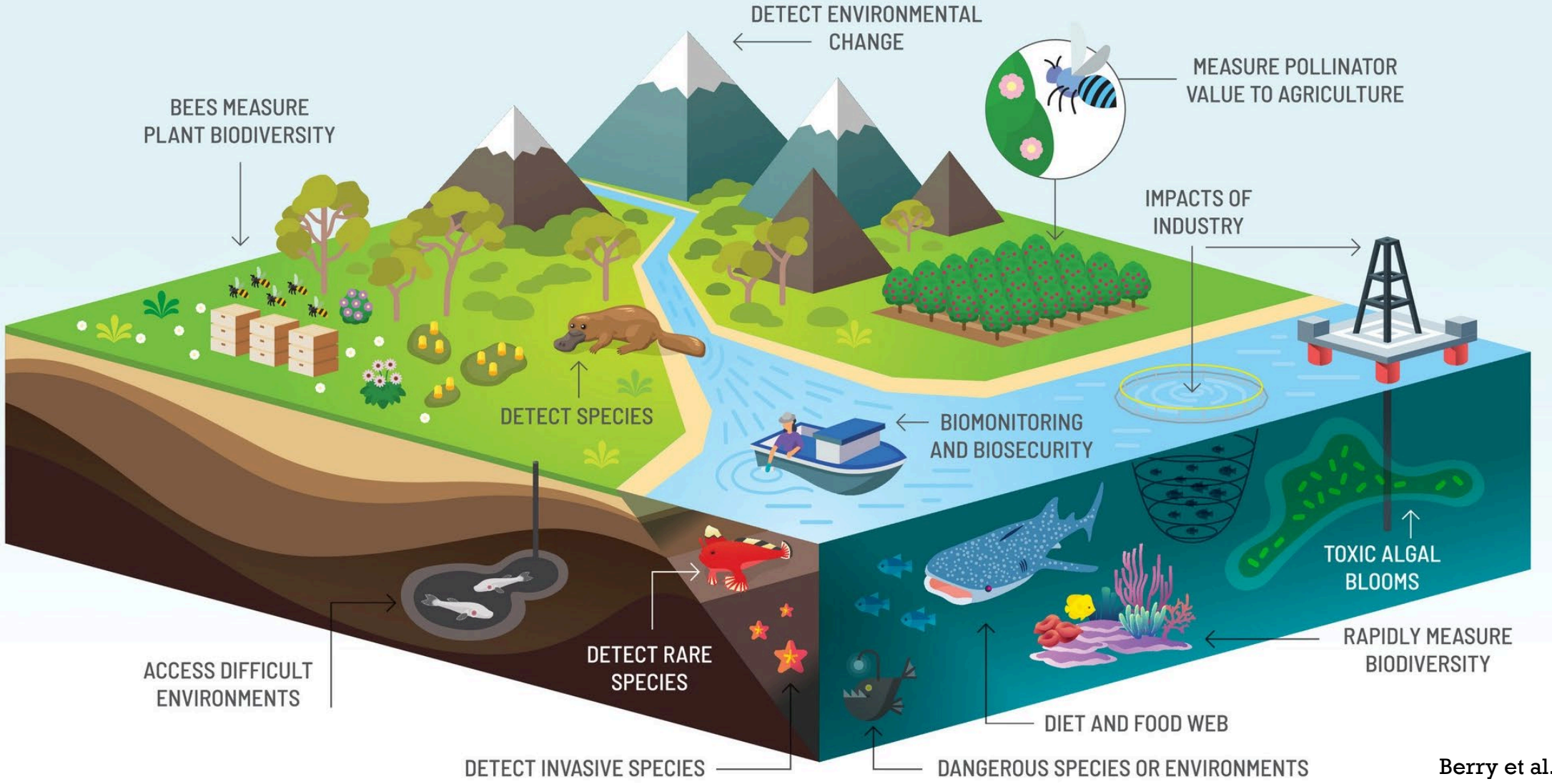
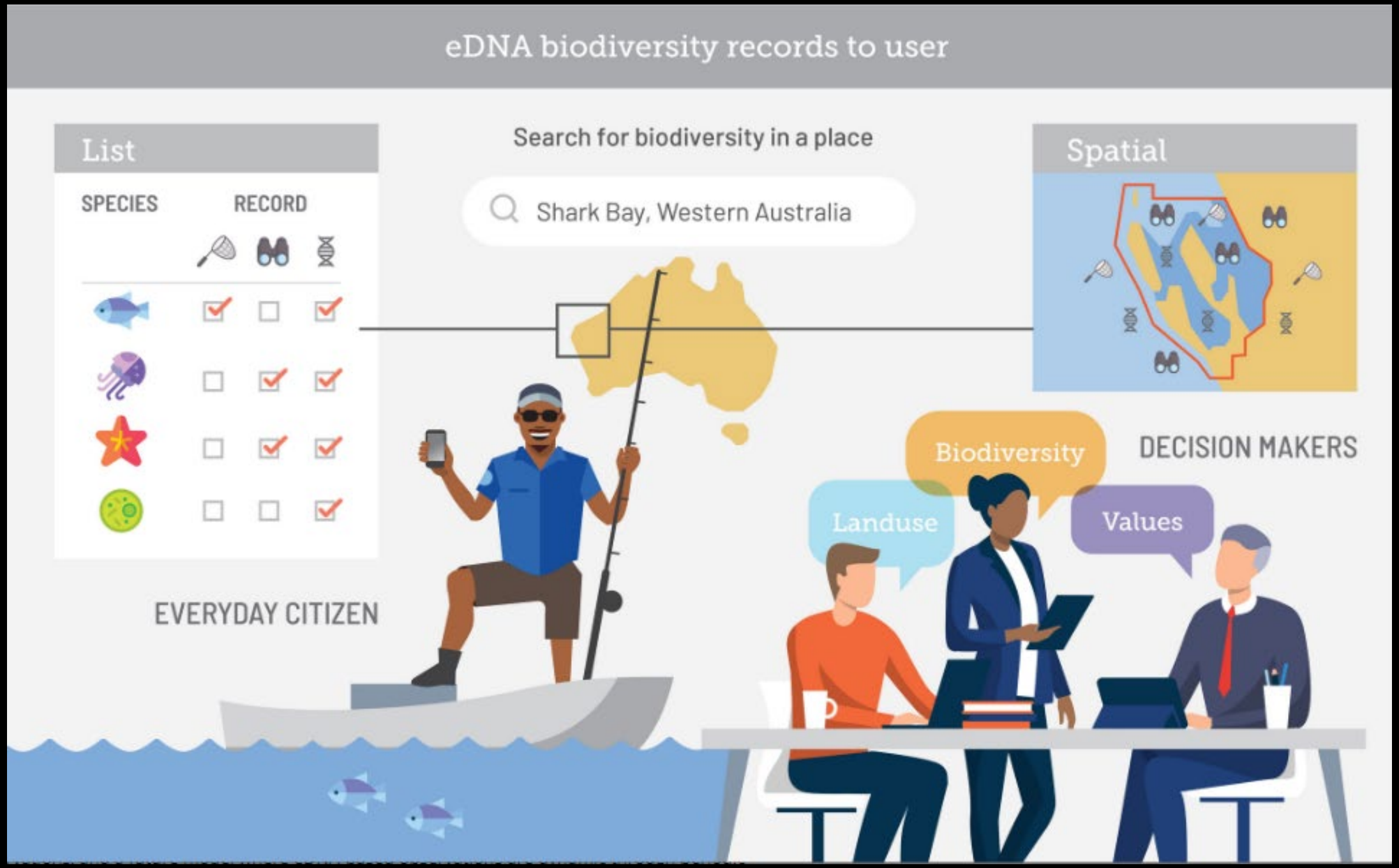
Esser et al. 2024

Applications of **environmental DNA** (eDNA) in the environment



Berry et al. 2021

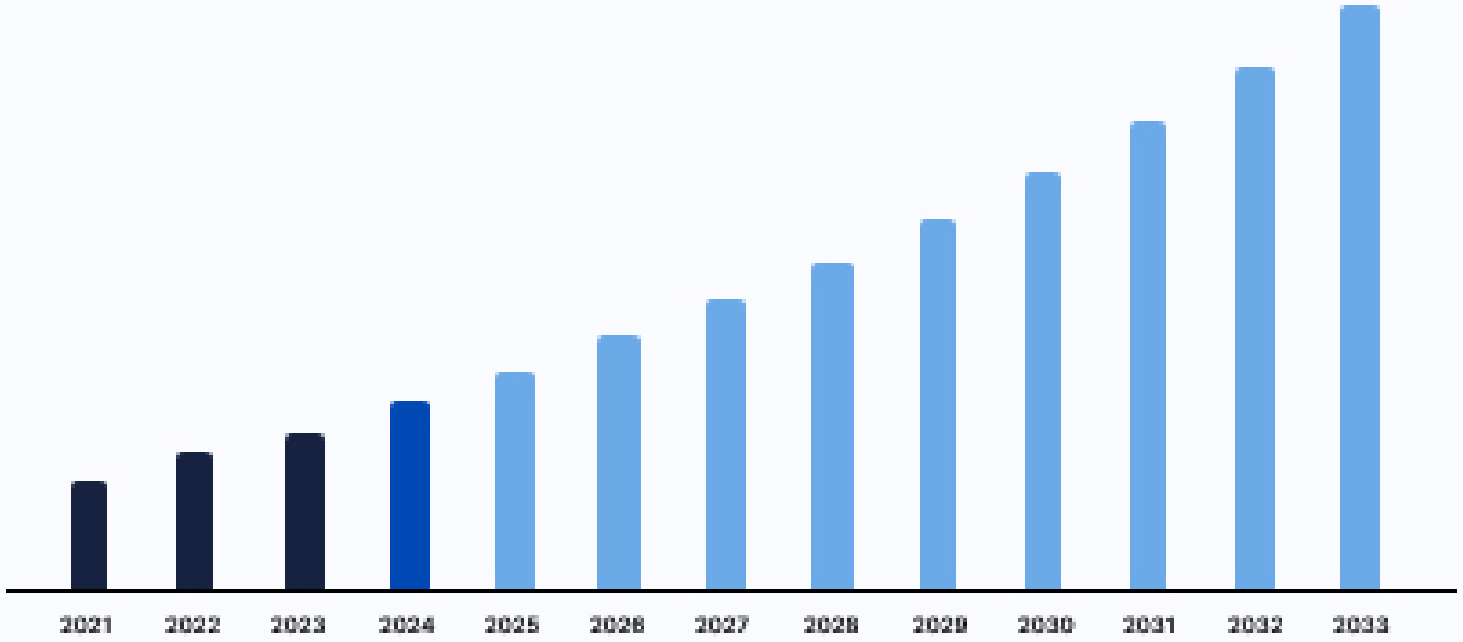


Berry et al. 2021

National Aquatic Environmental DNA Strategy

DNA Sequencing Market

Forecast 2025-2033



straits research

Source: www.straitsresearch.com

Market Size in 2024

USD 14.88 billion

17.62%

CAGR (2025-2033)

Market Size in 2033

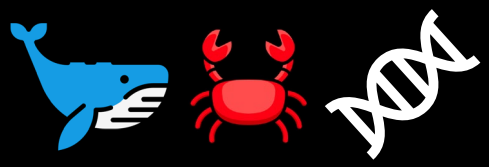
USD 74.89 billion

THERE IS ALWAYS SOMEONE

WILLING TO DO IT CHEAPER

What are the limitations of eDNA?

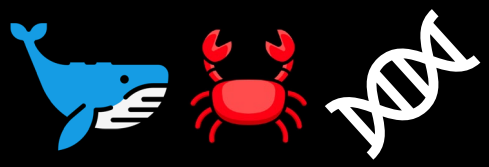
What are the limitations of eDNA?



Detection ≠ Abundance

- PCR stochastic/bias
- Different shedding rates
- eDNA stability vs degradation

What are the limitations of eDNA?



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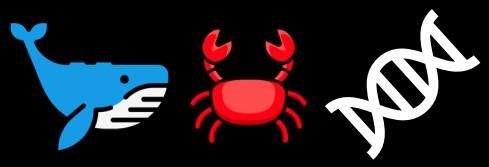
Contamination & degradation:

- Environmental conditions
- Sample preservation
- Streamlined protocols

What are the limitations of eDNA?



Detection ≠ Abundance

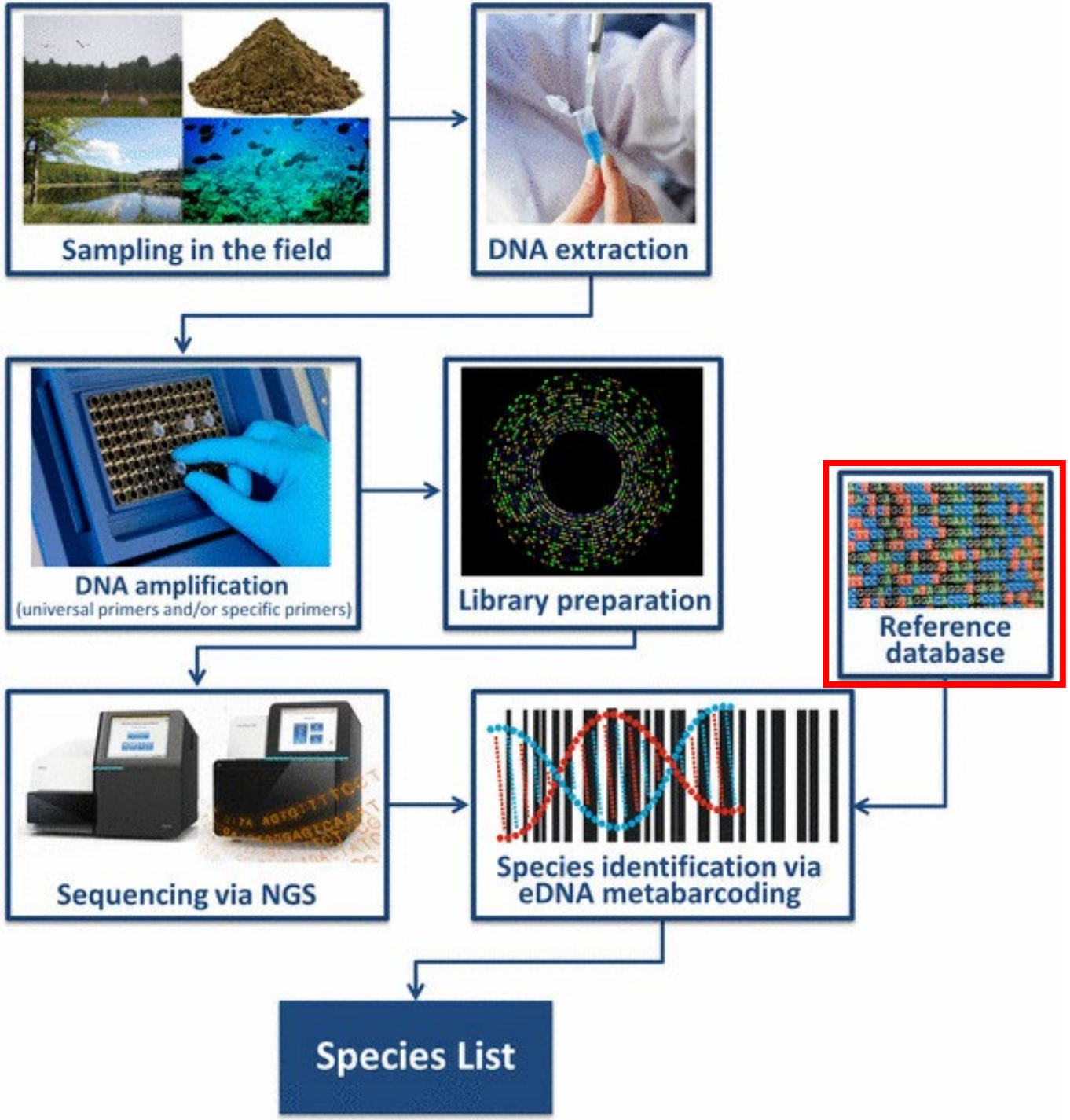
- PCR stochastic/bias
- Different shedding rates
- eDNA stability vs degradation

Contamination & degradation:

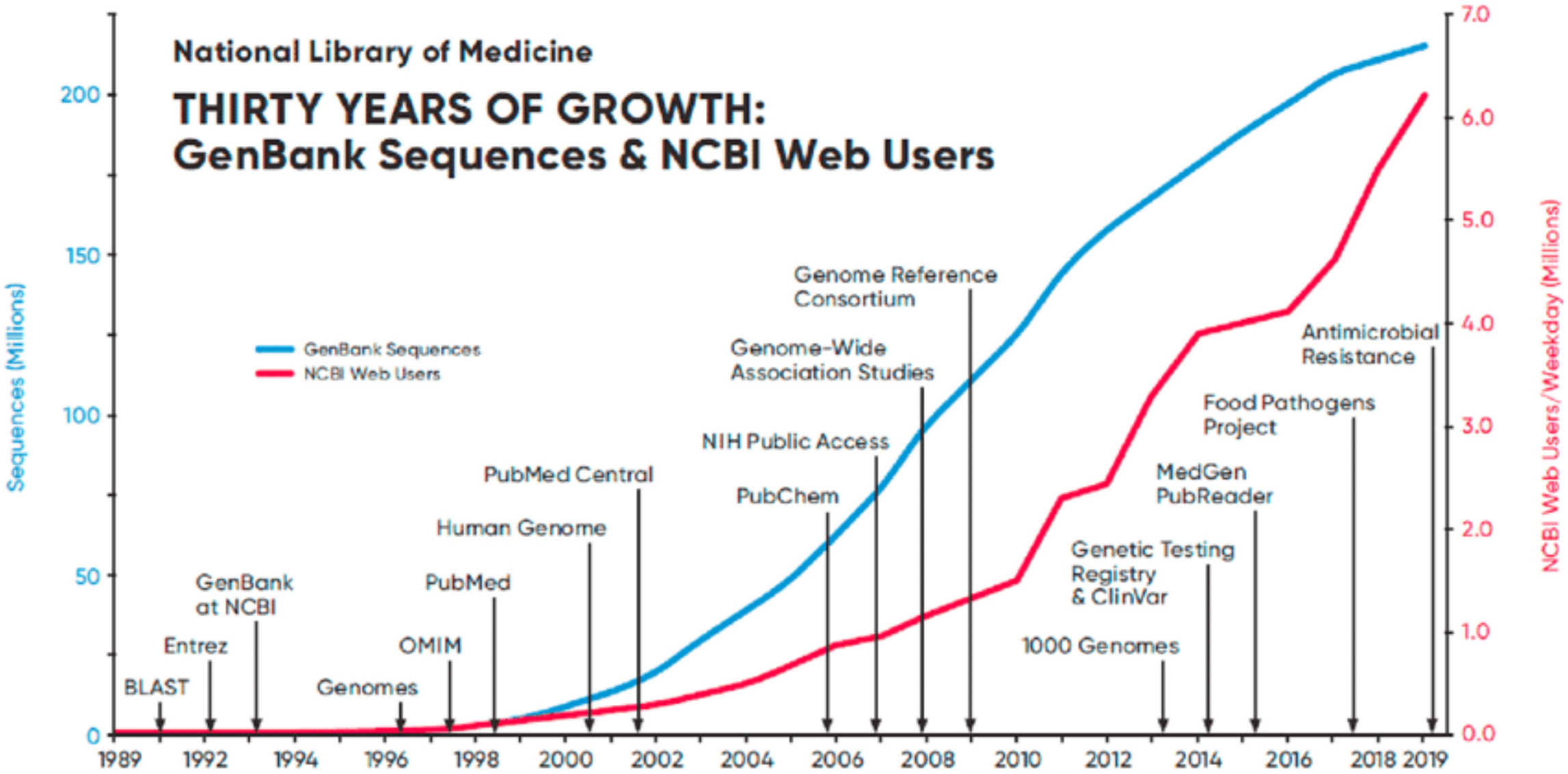
- Environmental conditions
- Sample preservation
- Streamlined protocols

Reference database gaps

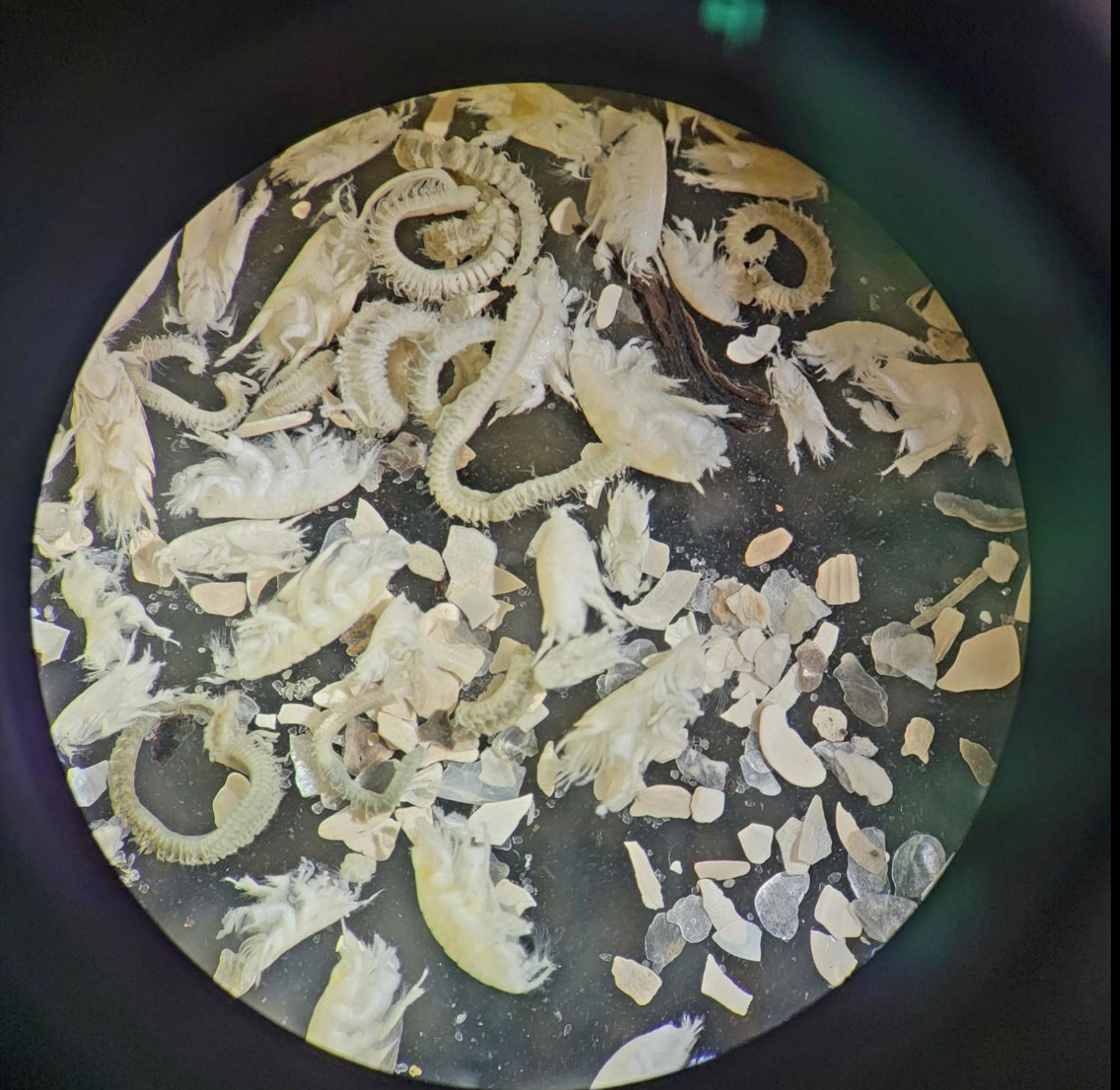
- Barcoding is limited in some groups
- Erroneous sequences
- Low representation of other markers



Xie et al. 2018



Gaffney et al. 2020



Local knowledge

THANK YOU!

TEXAS A&M UNIVERSITY
GALVESTON CAMPUS®

Texas Higher Education
COORDINATING BOARD

yshahesmaeili@tamu.edu
yshah@utexas.edu

GULF eDNA NETWORK

A REVIEW OF PROGRESS SINCE GEN's FOUNDING SUMMER OF 2025

JAELYN RODRIGUEZ
Texas A&M University at Galveston

The Gulf eDNA Network was founded by a collaborative group of early to mid-career scientists at Texas A&M University at Galveston and the University of Texas Marine Science Institute in Port Aransas.

THE GULF eDNA NETWORK TEAM

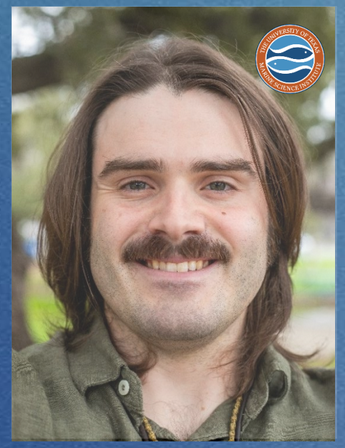
Dr. Sheila Kitchen

Dr. Yasmina Shah Esmaeili

Dr. Jordan Casey

Jaelyn Rodriguez

Ingrid Bunholi



Lance David Malcom Jr.

Marissa Kordal

United by a shared commitment to biodiversity monitoring and conservation, our goal is to connect researchers across disciplines and institutions to advance environmental DNA (eDNA) research in the Gulf of Mexico.

eDNA ON THE RISE

Non-Destructive
Non-disruptive ecosystem sampling

Versatile
Flexible applications from lab to field

Innovative
Improvements in analysis accuracy

Collaborative
Global use eases research co-ops

eDNA ON THE RISE

Collaborative

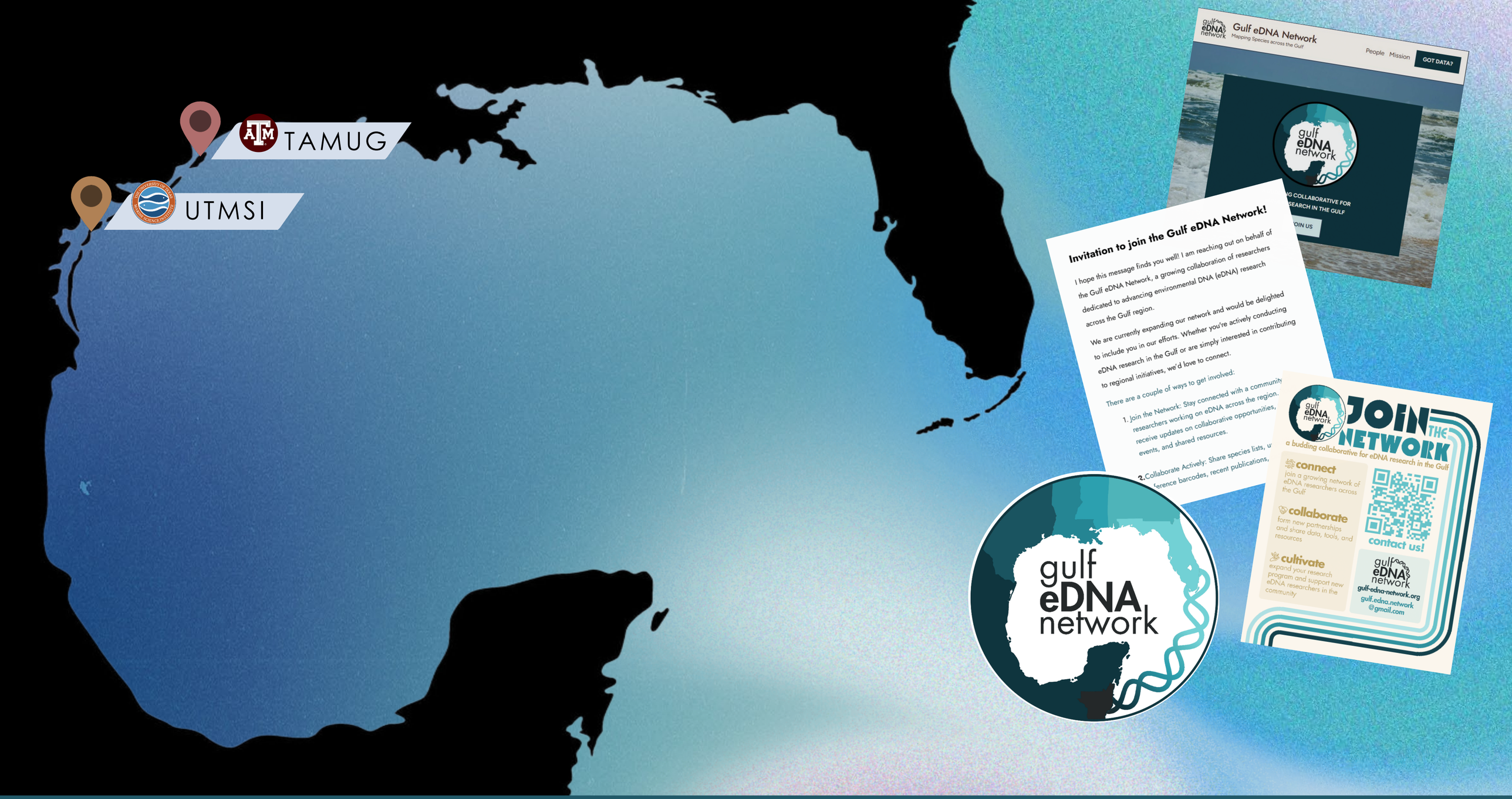
Challenges

No standardized eDNA protocol

No Region-Specific Reference Library

No eDNA-Based Network for the Gulf

The Network


TAMUG
UTMSI
Gulf eDNA Network
Mapping Species across the Gulf
People
Mission
GOT DATA?
Invitation to join the Gulf eDNA Network!
I hope this message finds you well! I am reaching out on behalf of the Gulf eDNA Network, a growing collaboration of researchers dedicated to advancing environmental DNA (eDNA) research across the Gulf region.
We are currently expanding our network and would be delighted to include you in our efforts. Whether you're actively conducting eDNA research in the Gulf or are simply interested in contributing to regional initiatives, we'd love to connect.
There are a couple of ways to get involved:
1. Join the Network: Stay connected with a community of researchers working on eDNA across the region. receive updates on collaborative opportunities, events, and shared resources.
JOIN THE NETWORK
a budding collaborative for eDNA research in the Gulf
connect
join a growing network of eDNA researchers across the Gulf
collaborate
form new partnerships and share data, tools, and resources
cultivate
expand your research program and support new eDNA researchers in the community
contact us!
gulf-edna-network.org
gulf.edna.network@gmail.com
gulf eDNA network


TAMUG
UTMSI
102
MEMBERS
4 COUNTRIES
11 STATES
55 UNIVERSITIES
or ORGANIZATIONS


102
MEMBERS


102
MEMBERS

gulf eDNA network


gulf
eDNA
network

connect

Join a growing network of eDNA researchers

collaborate

Form new partnerships across labs, institutions, and regions

cultivate

streamline research with our reference library

Compile a comprehensive species list for the Gulf

Close gaps in existing reference databases

Generate DNA barcodes for underrepresented taxa

Provide a regional reference library for the Gulf

Create a platform to share these resources

STEPS TO SUCCESS

☐ Compile Species Lists

– Retrieve information from online databases
– Organize classification and source information

☐ Conduct Gap Analysis

– Identify underrepresented groups in databases to identify priorities for sequencing

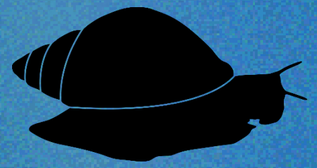
Compile Species List

WHY A SPECIES LIST?




GOAL:
IDENTIFY UNDER-REPRESENTED GoM SPECIES IN GENOMIC DATABASES




DATABASES USED FOR SPECIES SEARCH

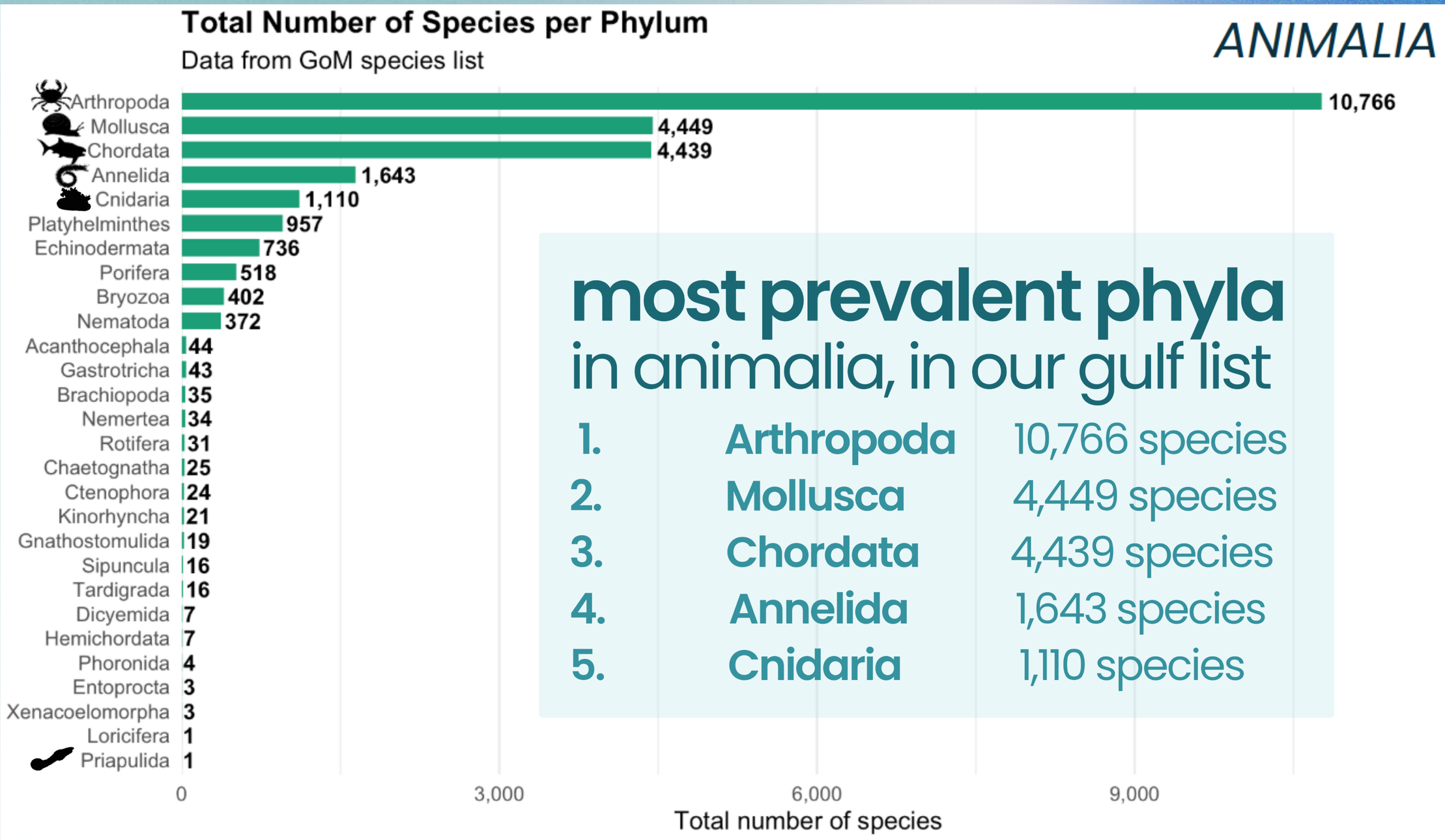
WoRMS
World Register of Marine Species

LITERATURE

GBIF
Global Biodiversity Information Facility


3961
TOTAL SPECIES
IN THE GoM LIST


25364
ANIMAL SPECIES


Total Number of Species per Phylum
Data from GoM species list
ANIMALIA
Arthropoda 10,766
Mollusca 4,449
Chordata 4,439
Annelida 1,643
Cnidaria 1,110
Platyhelminthes 957
Echinodermata 736
Porifera 518
Bryozoa 402
Nematoda 372
Acanthocephala 44
Gastrotricha 43
Brachiopoda 35
Nemertea 34
Rotifera 31
Chaetognatha 25
Ctenophora 24
Kinorhyncha 21
Gnathostomulida 19
Sipuncula 16
Tardigrada 16
Dicyemida 7
Hemichordata 7
Phoronida 4
Entoprocta 3
Xenacoelomorpha 3
Loricifera 1
Priapulida 1
0
3,000
6,000
9,000
Total number of species
most prevalent phyla
in animalia, in our gulf list
1. Arthropoda 10,766 species
2. Mollusca 4,449 species
3. Chordata 4,439 species
4. Annelida 1,643 species
5. Cnidaria 1,110 species

STEPS TO SUCCESS

- [x] Compile Species Lists
- [ ] Conduct Gap Analysis

Gap Analysis

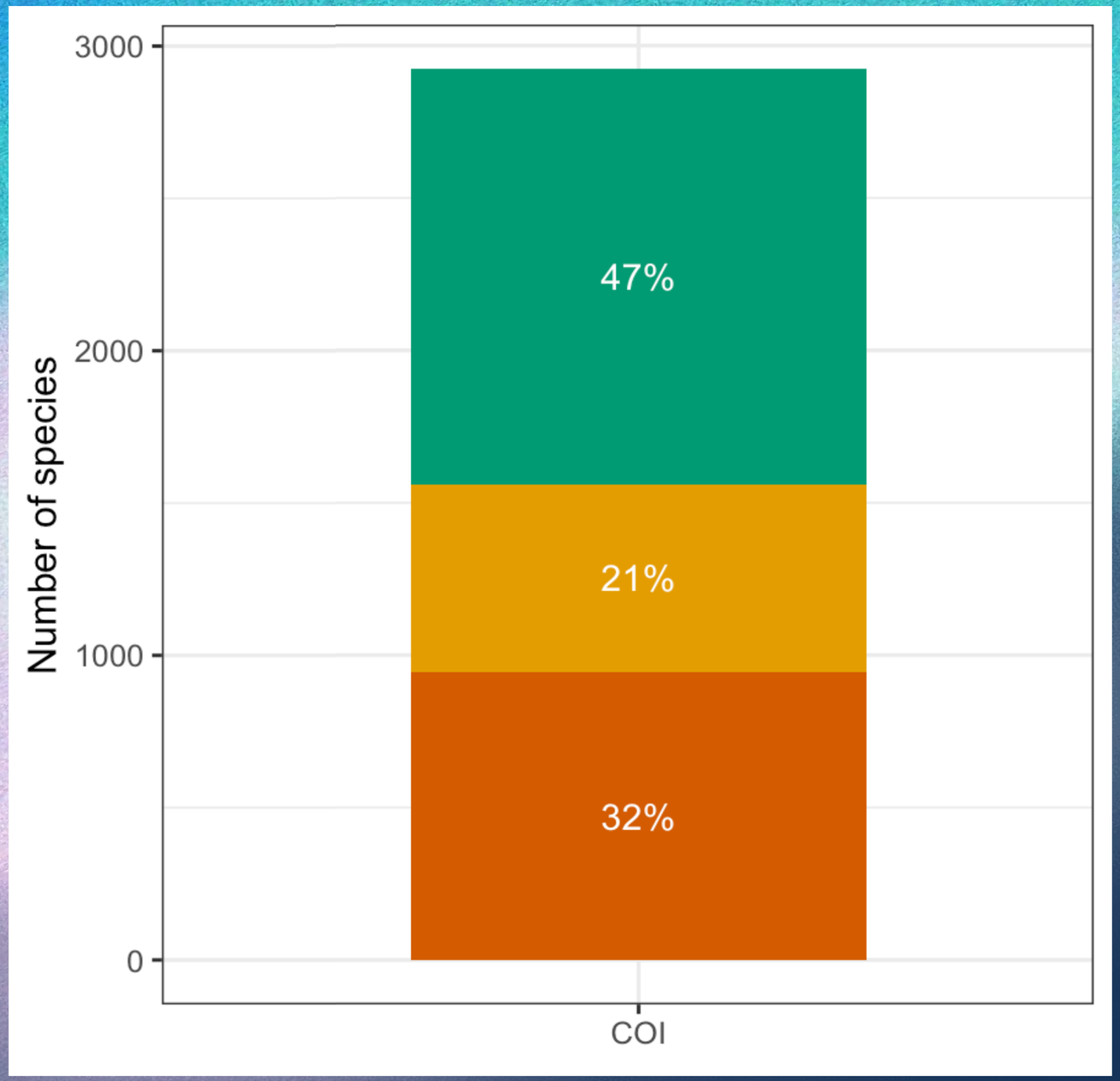
LIST FIND MATCHES DATA

DEFINING COI

56.2% of our animal species list is MISSING COI barcodes from the database

top six most abundant phyla in Animalia

% COI barcodes missing in GenBank per phyla



Local reference

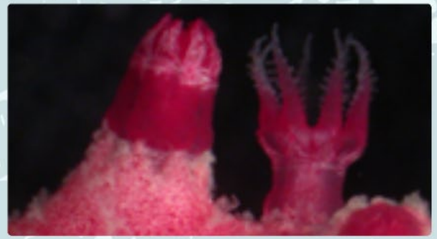
Needs local reference

No reference

MOST WANTED

The most abundant Gulf species that have no entries in GenBank

Atlantic Calico Scallop
Argopecten gibbus
2,498 occurrences



White Eye Sea Spray
Thesea nivea
2,236 occurrences

Atlantic Giant Cockle
Dinocardium robustum
1,901 occurrences

Clown Goby
Microgobius gulosus
1,897 occurrences

STEPS TO SUCCESS

- [ ] Compile Species Lists
- [ ] Conduct Gap Analysis

LOOKING AHEAD

Just the Beginning!

Continuing Gap Analysis

Including further markers and target groups

Creating a Regional Reference Library

Growing the Network

connect

Join a growing network of eDNA researchers

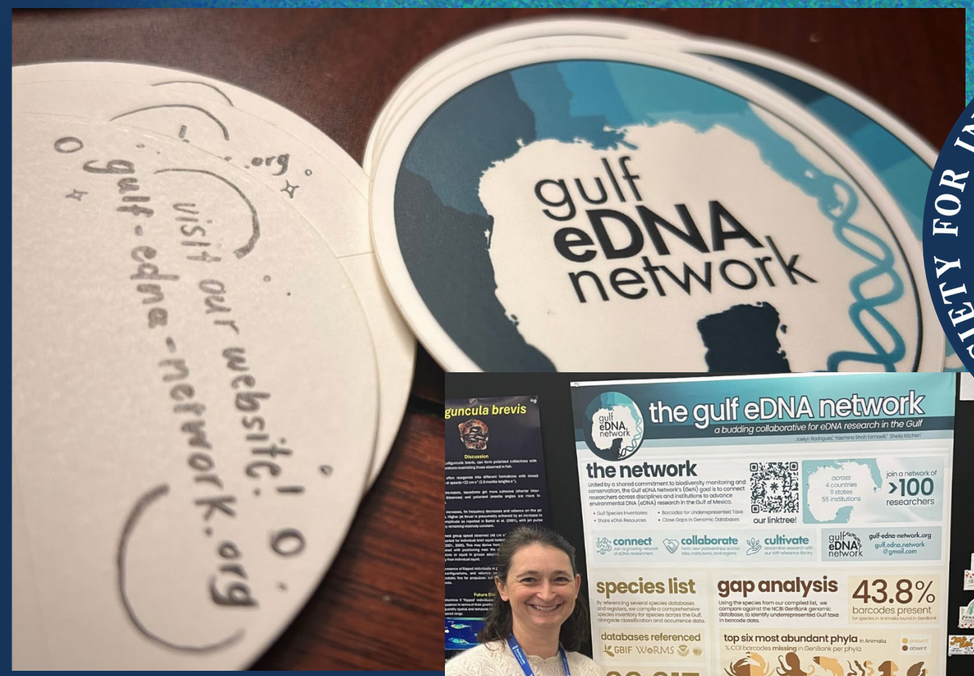
collaborate

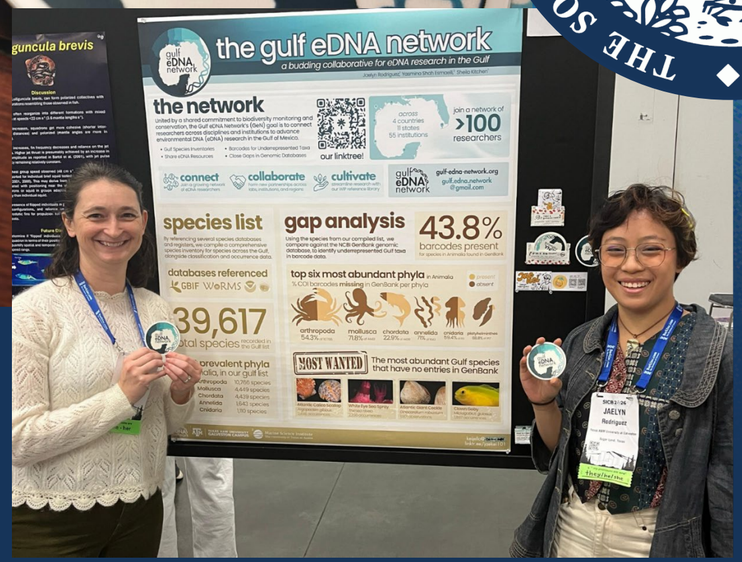
Form new partnerships across labs, institutions, and regions

cultivate

streamline research with our reference library

CONNECTING





SICB

Gained 12 Members!

THE SOCIETY FOR INTEGRATIVE AND COMPARATIVE BIOLOGY

GULF of AMERICA ALLIANCE

Gulf Con

2026 Global eDNA Conference
Seattle, Washington

Global eDNA Conference

COLLABORATIONS

Expanding to Industry, Policy, and Government Organizations

Emerging Research Projects

BioBlitz

Applying for Grants

COLLABORATE WITH US

Join as a Member
Receive our newsletter and email updates

Reach Out to Collab
Share species lists, sequences, and join projects

Join Our Team
Be a part of our leadership team (PR needed!)

Taxonomist?
Be a species list curator!

across
4 countries
11 states
55 institutions

join a network of
>100
researchers

gulf eDNA network

gulf-edna-network.org

gulf.edna.network@gmail.com

Galveston Bay Estuary Program

Texas Higher Education Coordinating Board

TCEQ

CONFERENCES
SEMINARS
WORKSHOPS

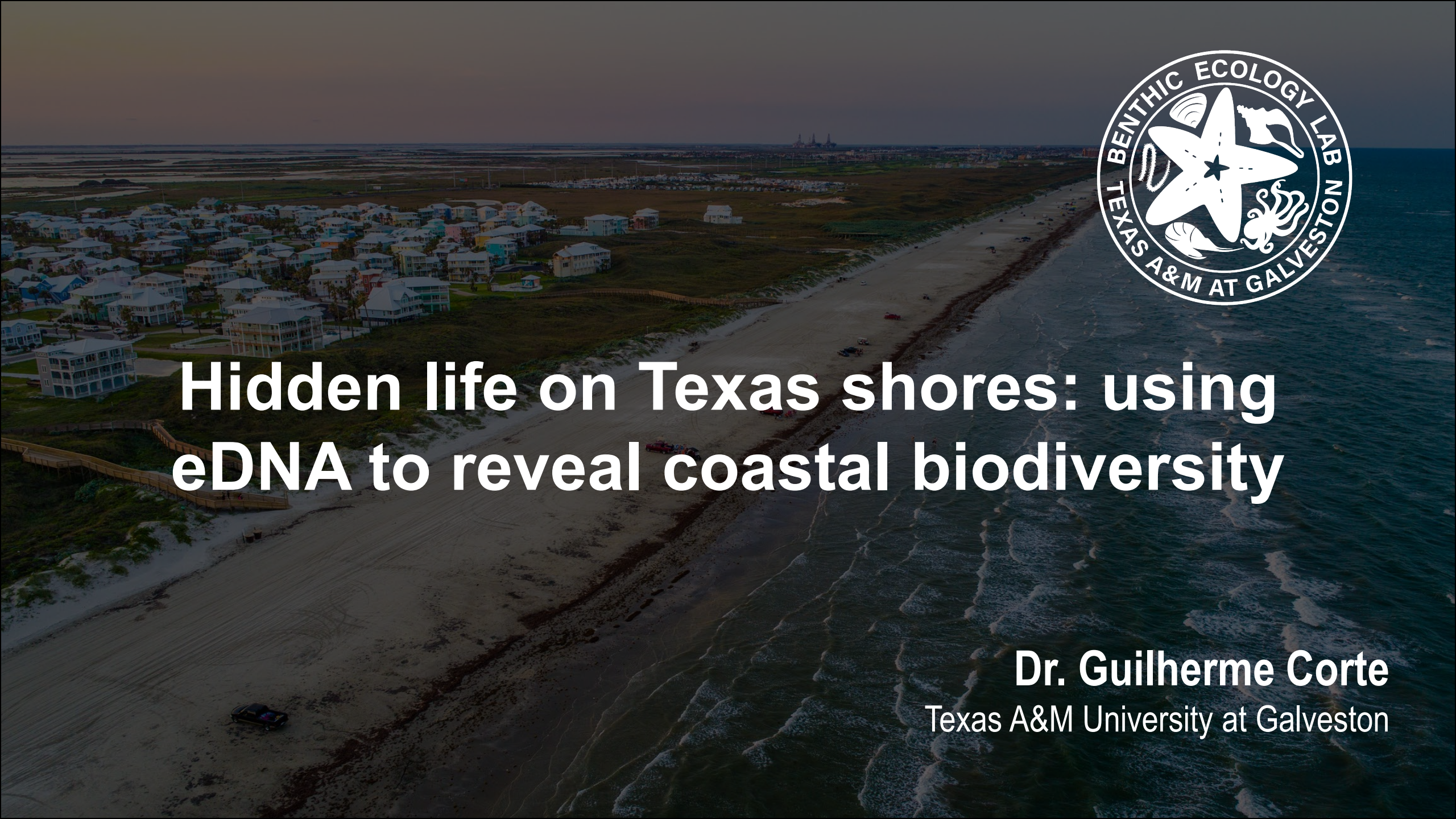
STATE OF THE BAY SYMPOSIUM

Texas A&M University
Galveston Campus

The University of Texas Marine Science Institute
The University of Texas at Austin

THANK YOU!

gulf eDNA network



Hidden life on Texas shores: using eDNA to reveal coastal biodiversity

Dr. Guilherme Corte
Texas A&M University at Galveston

WHAT IS THE MOST WIDESPREAD COASTAL ECOSYSTEM IN THE WORLD?

Sandy beaches make up about 1/3 of the world's ice-free coastlines

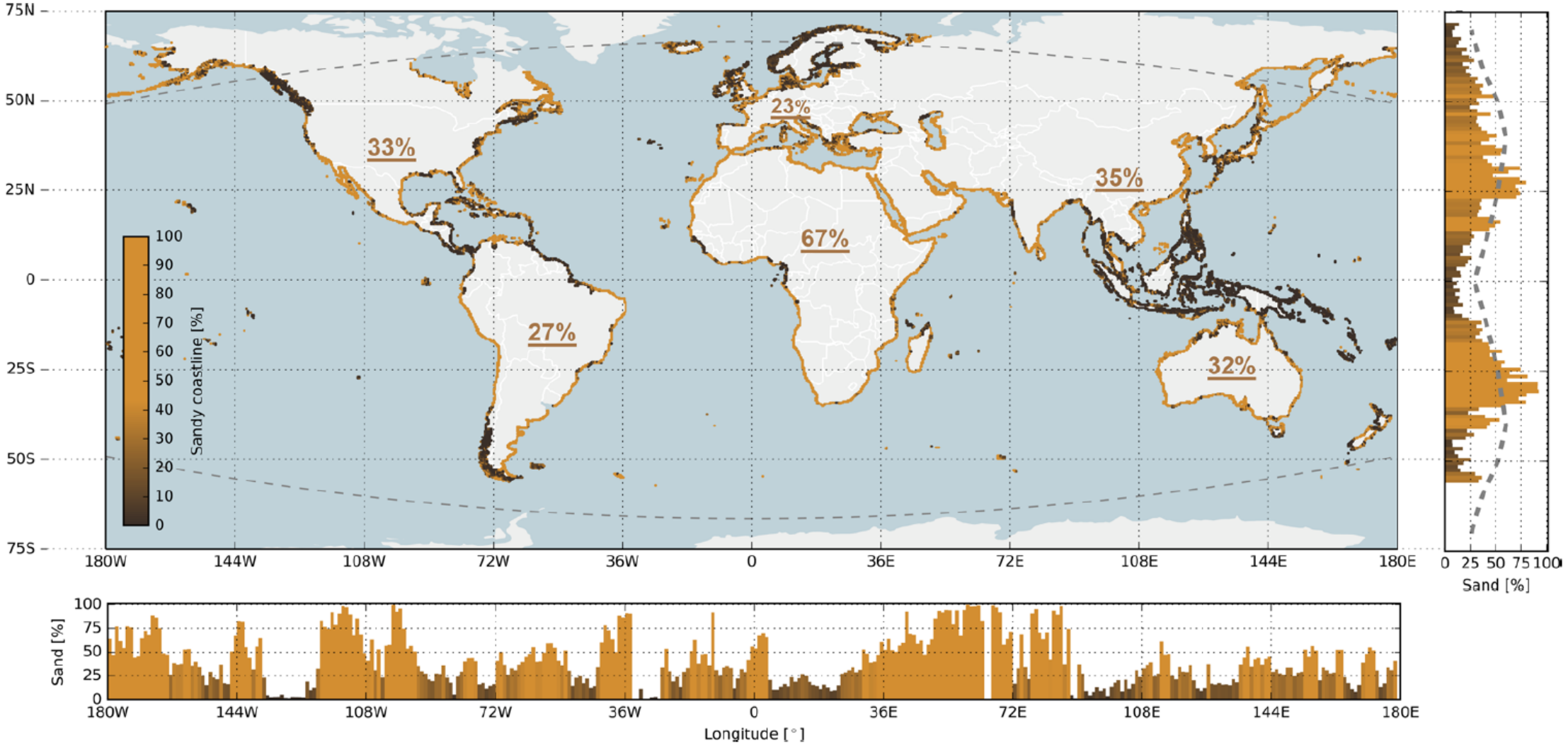


Figure 1. Global distribution of sandy shorelines.

Luijendijk et al. (2018) *Sci. Rep.*

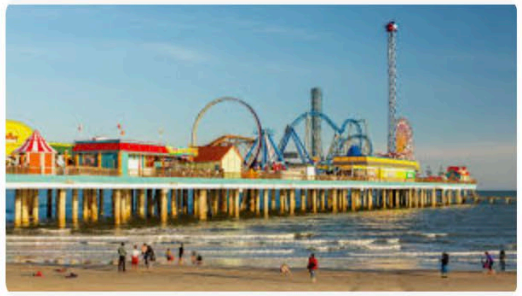
WHICH COASTAL ECOSYSTEM IS MOST USED BY HUMANS?

SANDY BEACHES

Google

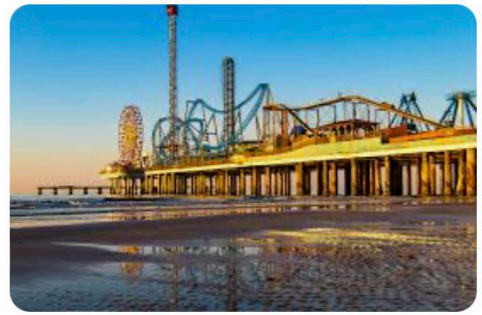
galveston

Texas beach | Island texas | Seawall | Hotel | Galveston seawall beach | Houston | Galveston hurricane | Galveston attractions



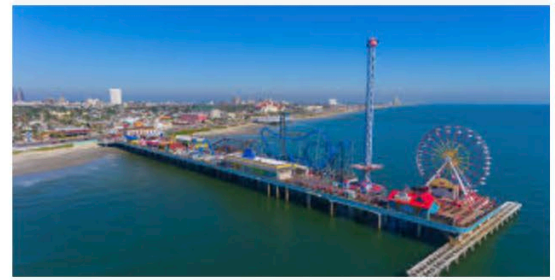
Expedia
Visit Galveston: 2026 Travel Guide for Galv...

Sand `N Sea Properties
Living in Galveston, TX: What to K...

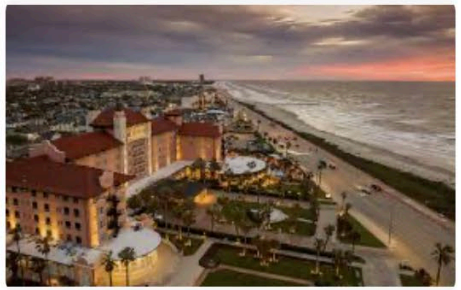


Travel Texas
A Dozen Ways To Enjoy Two Days In G...

Texas State Historical Association
Galveston County

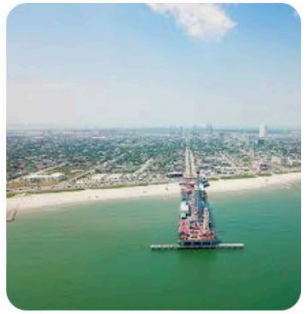


IHG Hotels & Resorts
Hotel In Galveston, TX On The Beach | Holida...

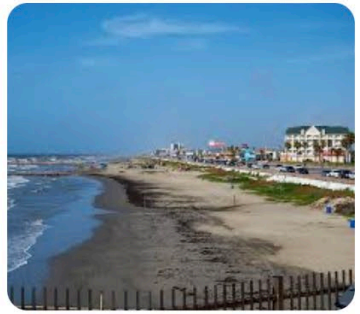


Texas Monthly
Galveston Is a Tourist Hot Spot Once...

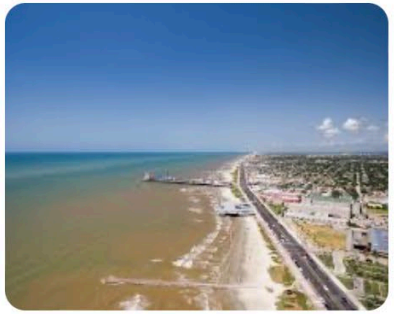
Tripadvisor
Galveston, TX: All You Must Know ...



Galveston
GALVESTON.COM: Se...

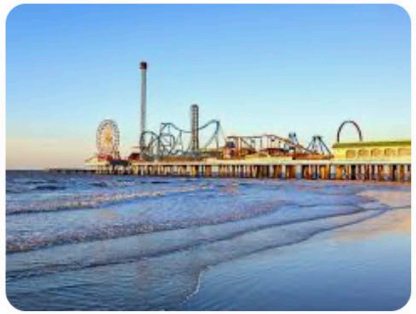


Tripadvisor
THE 15 BEST Things to Do i...

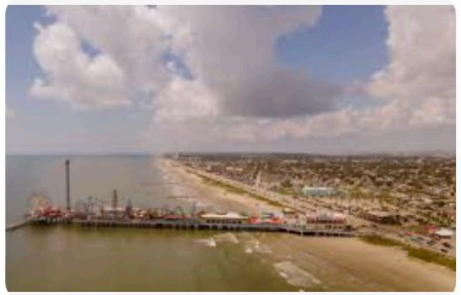


Wan Bridge
Moving to Galveston, TX: Every...

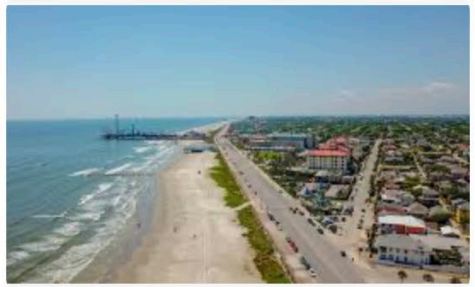
Travel + Leisure
The Ultimate Travel Guide to Galve...



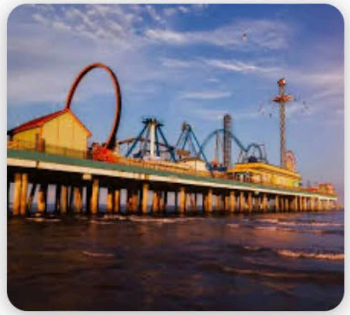
pods.ca



Princess Cruises

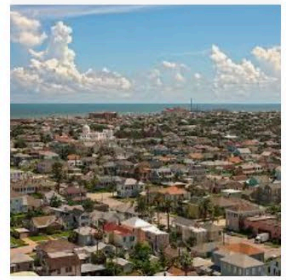


Visit Galveston



Port of Galveston

Texas Highways



Galveston

2.3. *Ecosystem services and sensitive features*

Sandy shores provide a wide range of ecosystem services, many of which are essential to support human uses of sandy coasts. The most important ecosystem services include: (1) sediment storage and transport; (2) wave dissipation and associated buffering against extreme events (storms, tsunamis); (3) dynamic response to sea-level rise (within limits); (4) breakdown of organic materials and pollutants; (5) water filtration and purification; (6) nutrient mineralisation and recycling; (7) water storage in dune aquifers and groundwater discharge through beaches; (8) maintenance of biodiversity and genetic resources; (9) nursery areas for juvenile fishes; (10) nesting sites for turtles and shorebirds, and rookeries for pinnipeds; (11) prey resources for birds and terrestrial wildlife; (12) scenic vistas and recreational opportunities; (13) bait and food organisms; and (14) functional links between terrestrial and marine environments in the coastal zone.

Defeo et al. (2009) *Est. Coast. Shelf Sci.*

The economic value of America's beaches

"There are about 3.4 billion visits to U.S. beaches annually. This is an enormous number of visits — more than 225% times greater than the combined annual attendance at all National Park properties from the Washington Monument to the Grand Canyon; state parks; all amusement-park attractions such as Disney World; all professional and collegiate football, basketball, and baseball games; cruises; and events of the National Association for Stock Car Auto Racing."

James R. Houston
U.S. Army Engineer Research and Development Center

."

The economic value of America's beaches

"Beach tourists spend $240 billion annually, more than the value of all crops grown in America or oil exported by Saudi Arabia. They generate an economic output of $520 billion."

James R. Houston
U.S. Army Engineer Research and Development Center

ENVIRONMENT FEATURES

Beaches: The Overlooked Engine of the American Economy

This country's best conservation investment is hidden in plain sight

Photo: Jeremiah Klein

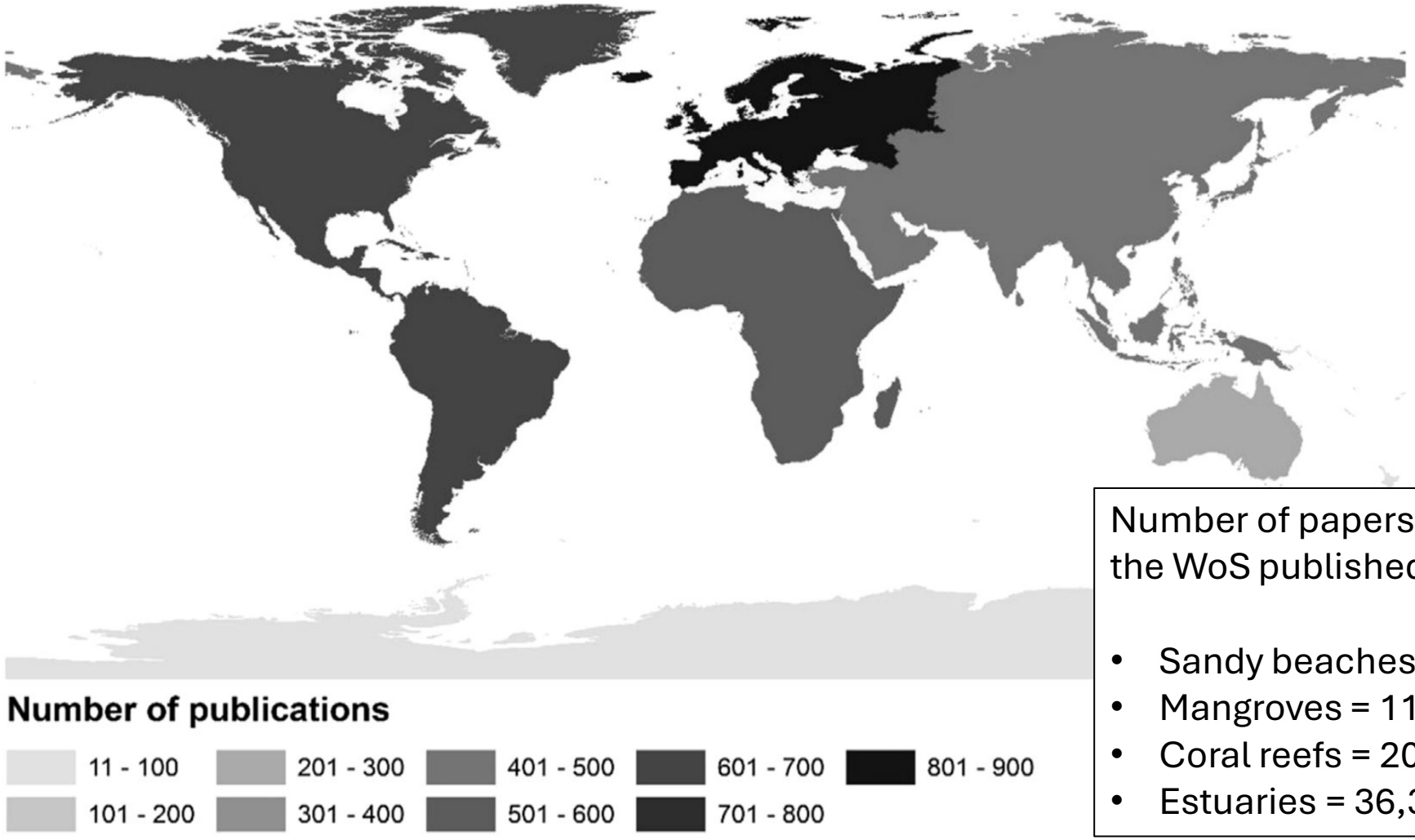
Bring Back Our Beaches
Oct 23rd, 2025. **Updated** 4 months ago.

SANDY BEACHES ARE AWESOME!!

WHICH COASTAL ECOSYSTEM IS THE LEAST STUDIED?

SANDY BEACHES ARE UNDERSTUDIED

UNDERSTUDIED ECOSYSTEMS



Number of papers indexed by the WoS published until 2014:

- Sandy beaches = 2,936
- Mangroves = 11,149
- Coral reefs = 20,065
- Estuaries = 36,358

Fig. 5. Distribution of field-based studies on sandy beaches by continent, with darker shades indicating a greater number of studies.

Nel et al. (2014) *Est Coast Shelf Sci*

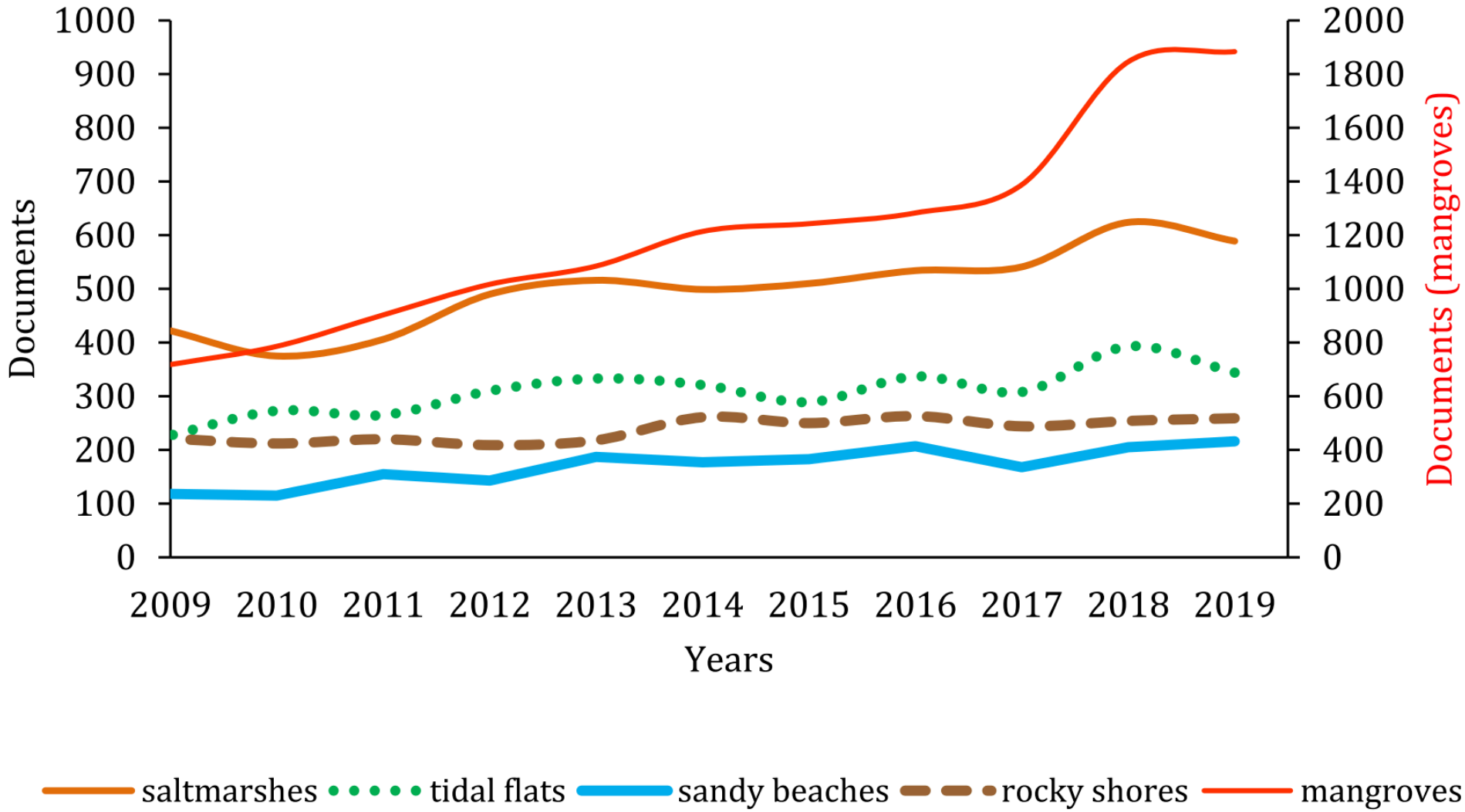


Fig. 1. The annual number of scientific articles mentioning sandy beaches registered in Scopus from 2009 to 2019. The number of publications related to other intertidal environments is also shown.

Lercari (2023) *Est Coast Shelf Sci*

WHY ARE SANDY BEACH ECOSYSTEMS OVERLOOKED?

Why are sandy beach ecosystems overlooked?

1. They are often perceived as biological deserts.
2. They are difficult to study.

DESERTS?

Charadrius melodus (Piping plover)


Disney · PIXAR
piper

Scolelepis squamata

Ocypode sp.

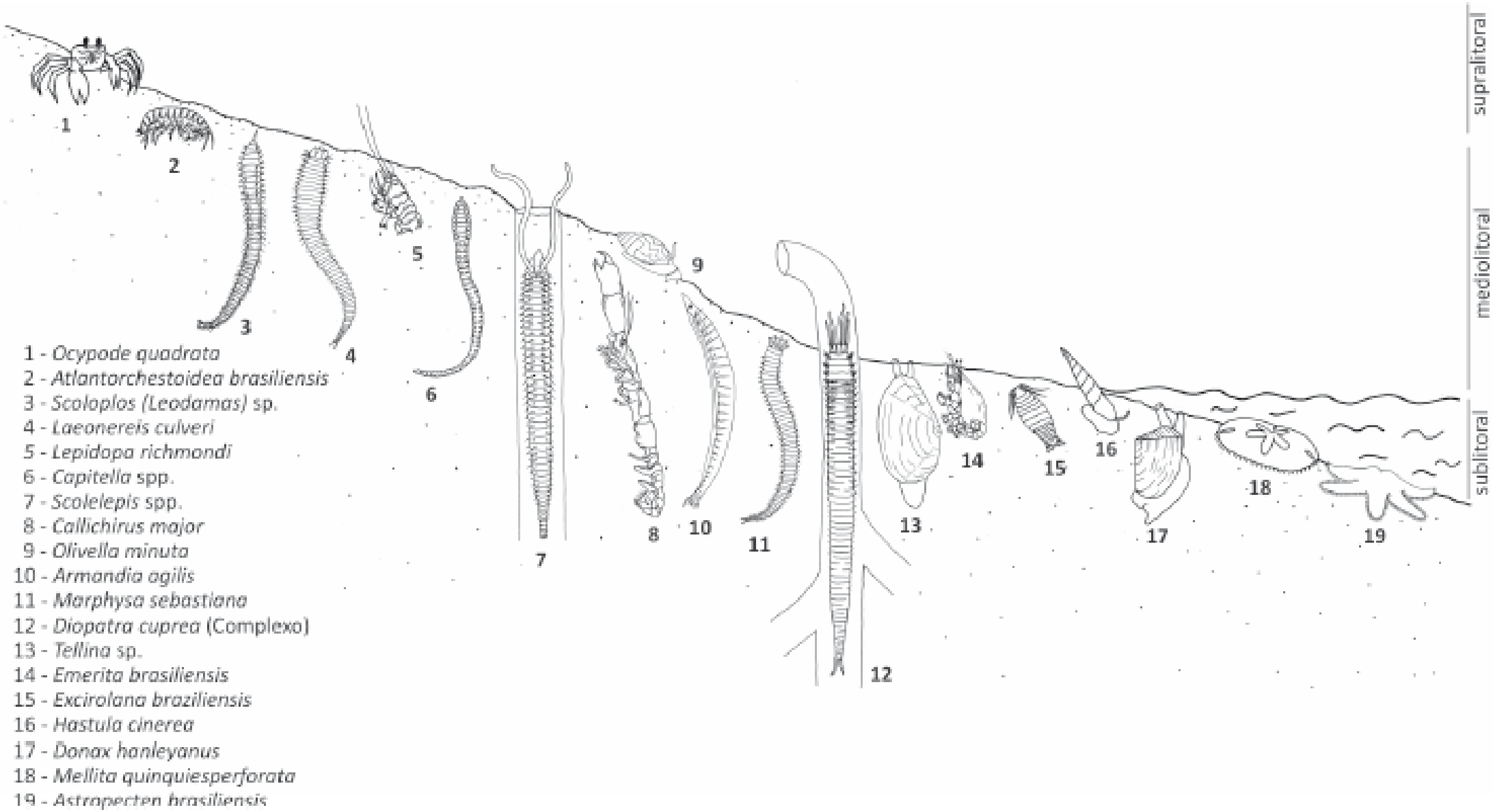
Donax hanleyanus

Glycinde multidens

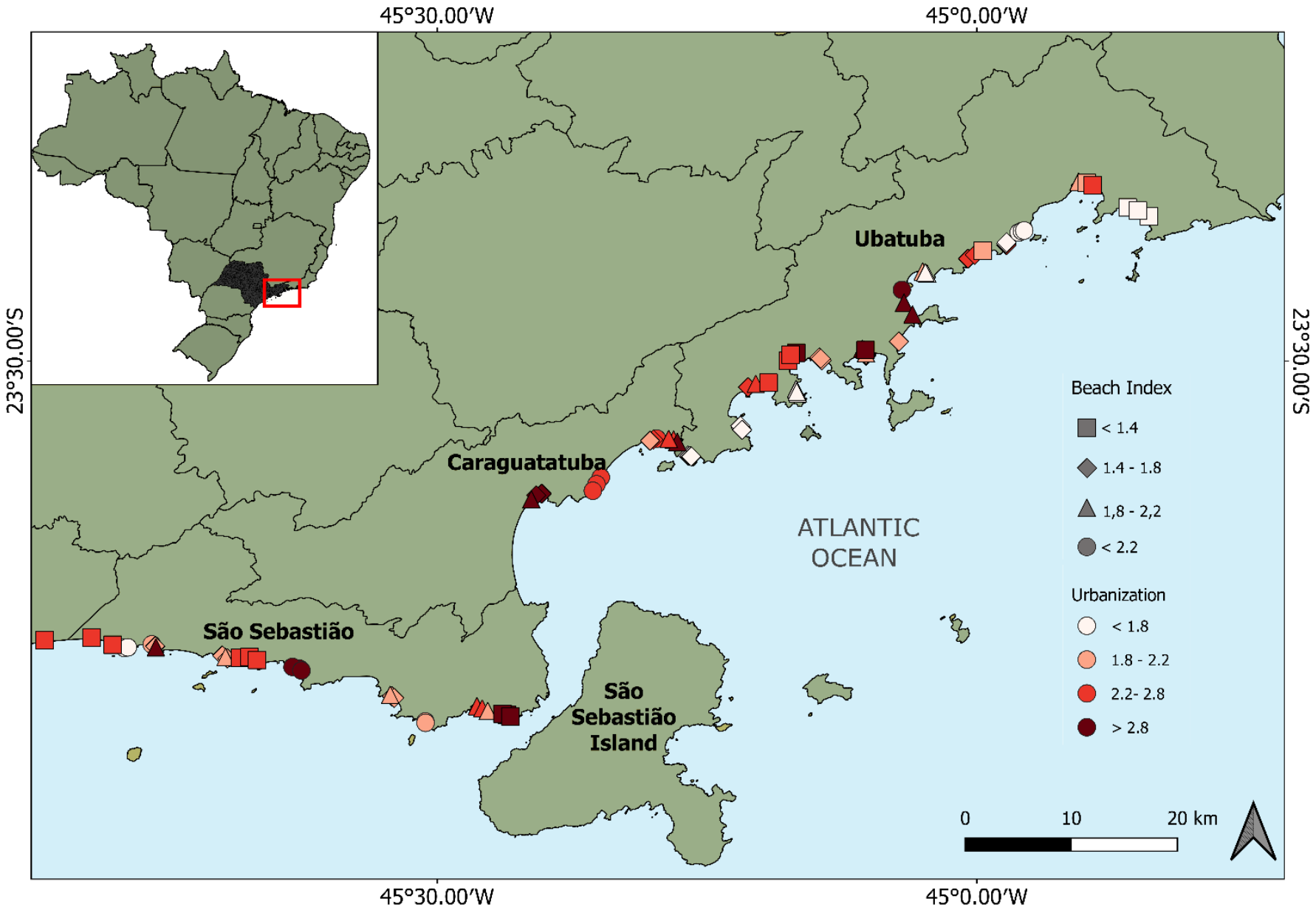
Emerita brasiliensis

Melitta quinquiesperforata

Source: Cifonauta

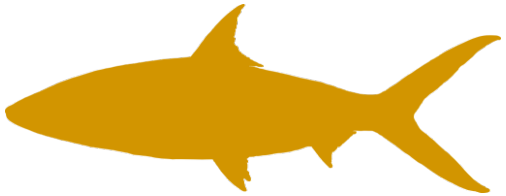


Corte and Amaral (2018) *Brazilian Sandy Beaches*



Corte et al. (2022) *Mar. Pollut. Bull.*; Shah Esmaeili et al. (2023) *Divers. Distrib.*

Fish

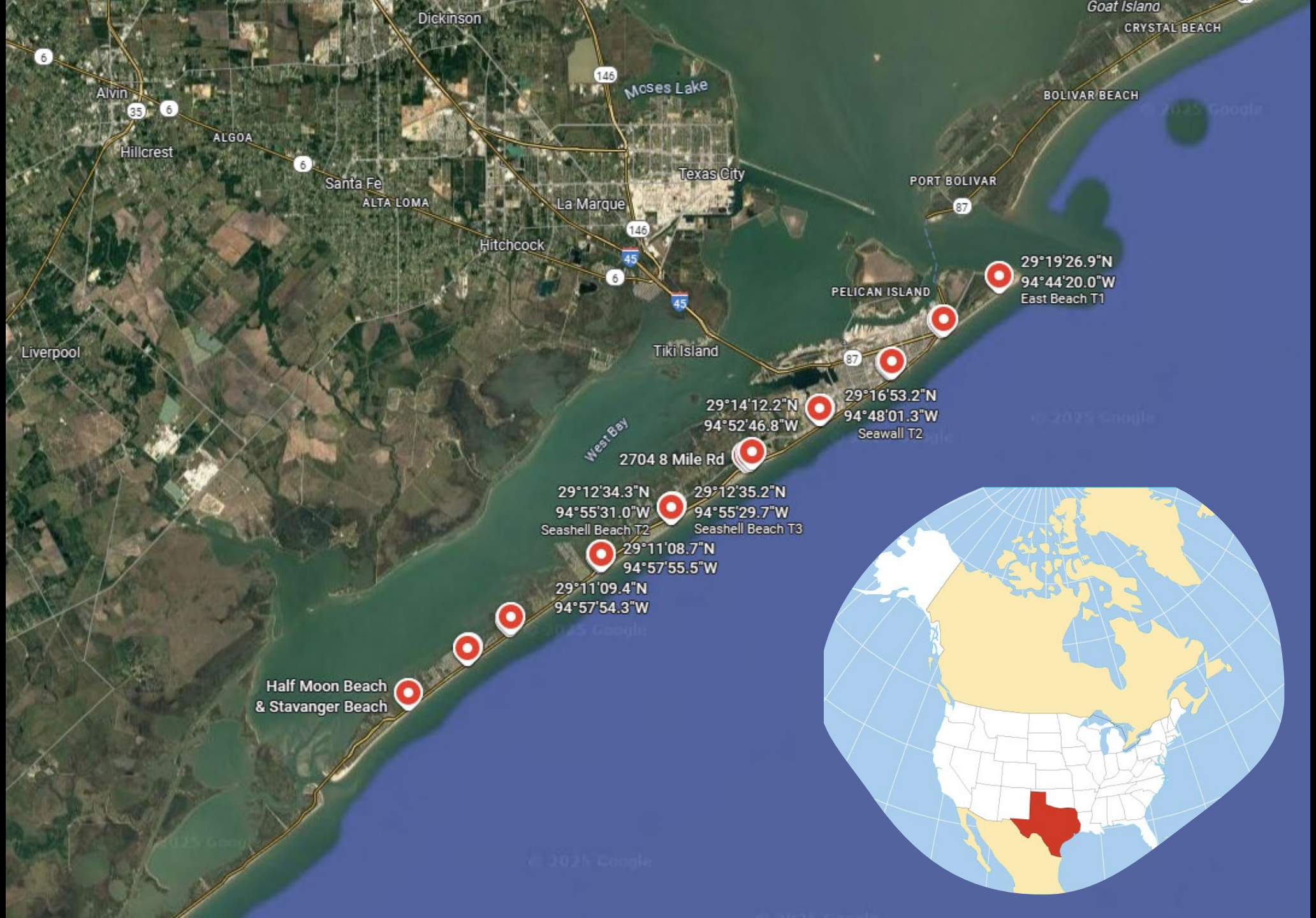


8766 individuals
64 species

Macrobenthos
5017 individuals
172 species

Corte et al. (2022) *Mar. Pollut. Bull.*; Shah Esmaeili et al. (2023) *Divers. Distrib.*

BENTHIC ECOLOGY LAB
Texas A&M at Galveston


Goat Island
CRYSTAL BEACH
Dickinson
Alvin
Moses Lake
BOLIVAR BEACH
ALGOA
Hillcrest
Santa Fe
ALTA LOMA
Texas City
PORT BOLIVAR
La Marque
Hitchcock
PELICAN ISLAND
29°19'26.9"N
94°44'20.0"W
East Beach T1
Liverpool
Tiki Island
29°16'53.2"N
94°48'01.3"W
Seawall T2
29°14'12.2"N
94°52'46.8"W
West Bay
2704 8 Mile Rd
29°12'34.3"N
94°55'31.0"W
Seashell Beach T2
29°12'35.2"N
94°55'29.7"W
Seashell Beach T3
29°11'08.7"N
94°57'55.5"W
29°11'09.4"N
94°57'54.3"W
Half Moon Beach
& Stavanger Beach
© 2025 Google

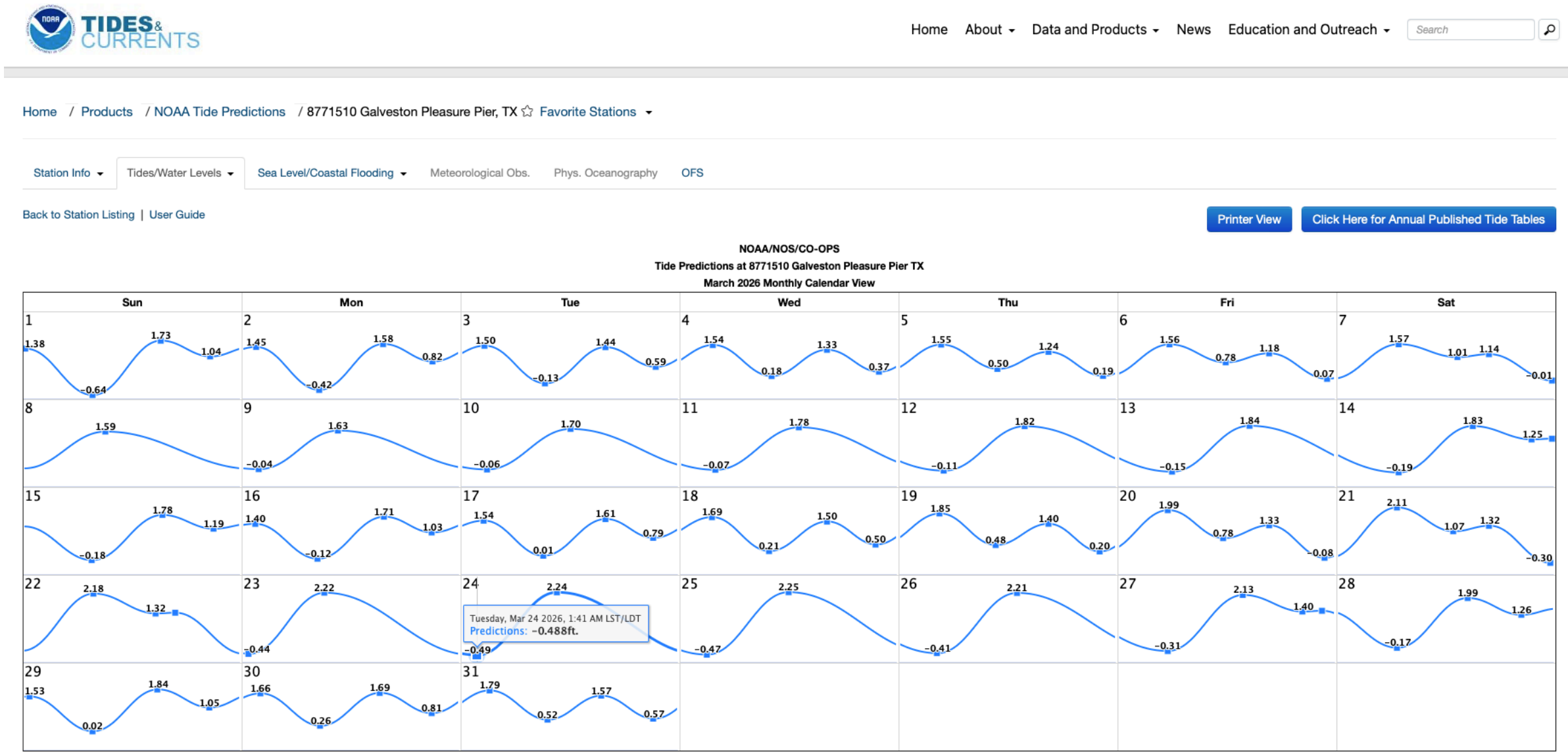
DESERTS?

Polychaeta	12111
Crustacea	6756
Mollusca	54
Insecta	328
Total	**19249**

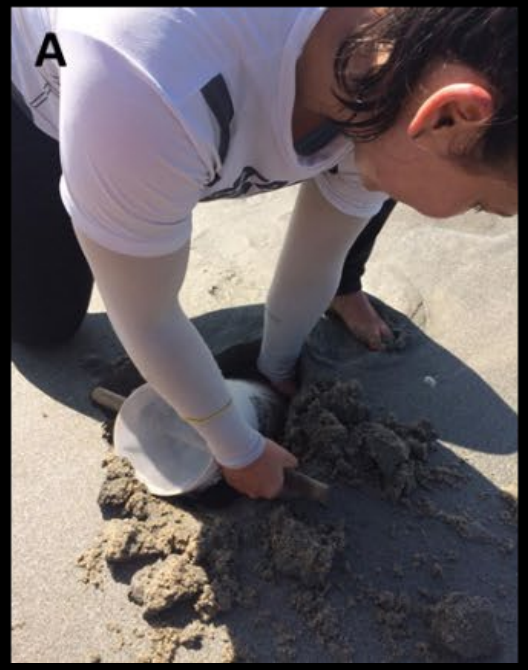
Why are sandy beach ecosystems overlooked?

1. ~~They are often perceived as biological deserts.~~
2. They are difficult to study.

TIME CONSTRAINTS



PHYSICALLY DEMANDING TO STUDY




BENTHIC ECOLOGY
TEXAS A&

REQUIRES SPECIALIZED TAXONOMIC EXPERTISE

HOW CAN THESE CHALLENGES BE MINIMIZED?

eDNA

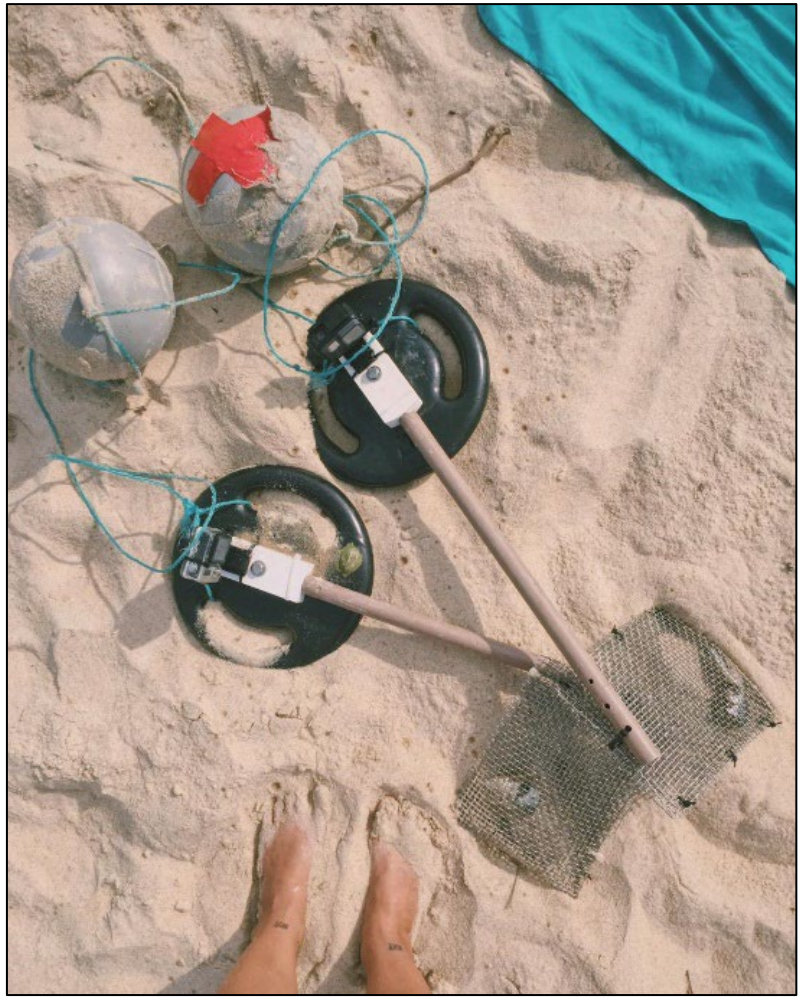
TIME CONSTRAINTS


NON-EXTRACTIVE

BUT DOES eDNA REALLY WORK?

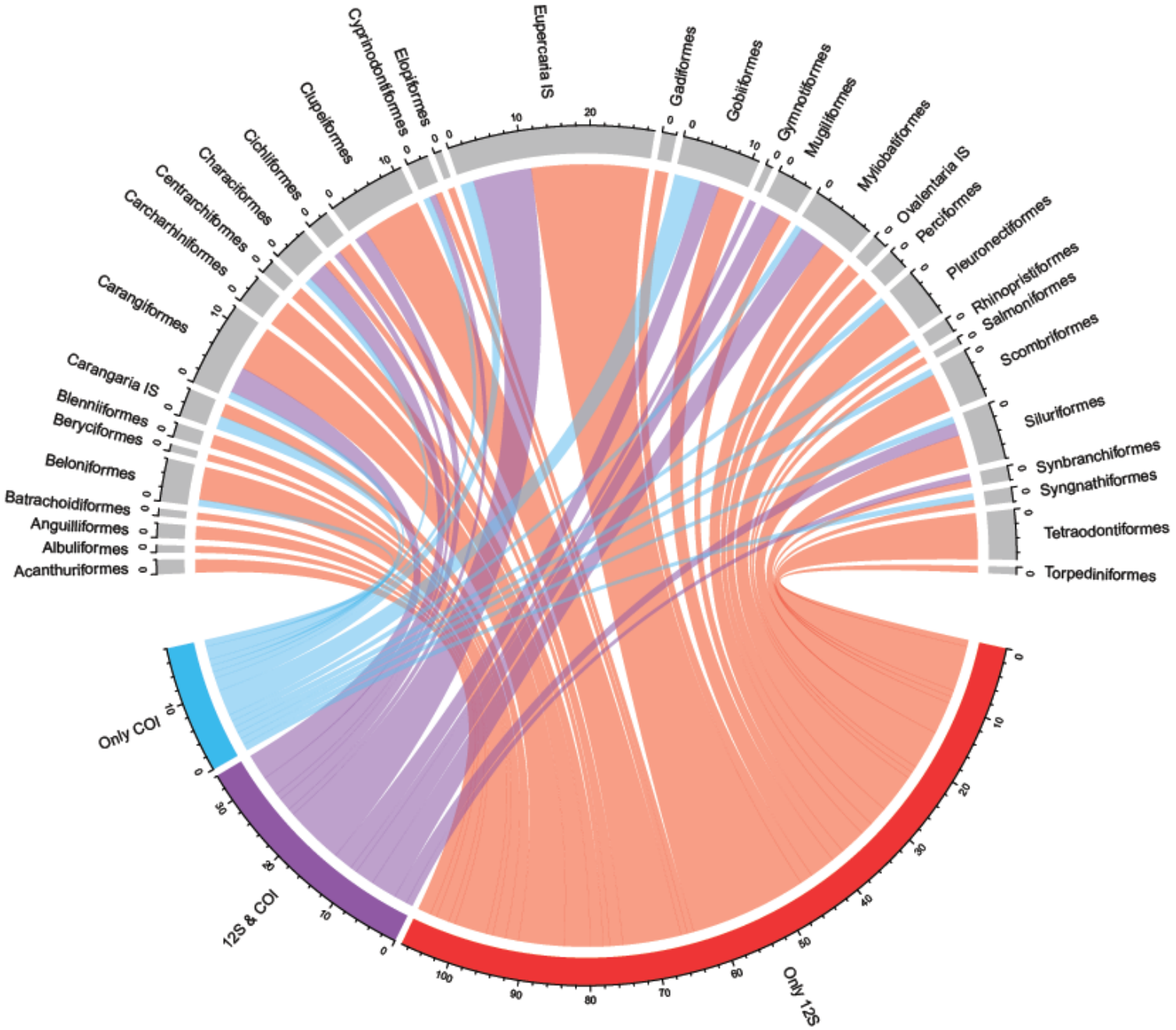
Seine net

Surf-BRUVs



Shah Esmaeili et al. (2022) *Mar. Ecol. Progr. Ser.;* Shah Esmaeili et al. (2023) *Divers. Distrib.*

Fishes:
159 species
141 using 12S
52 using COI
34 both markers



PATH FORWARD


Dickinson
Goat Island
CRYSTAL BEACH
Alvin
Moses Lake
BOLIVAR BEACH
ALGOA
Hillcrest
Santa Fe
ALTA LOMA
Texas City
PORT BOLIVAR
La Marque
Hitchcock
PELICAN ISLAND
29°19'26.9"N
94°44'20.0"W
East Beach T1
Liverpool
Tiki Island
29°16'53.2"N
94°48'01.3"W
Seawall T2
29°14'12.2"N
94°52'46.8"W
West Bay
2704 8 Mile Rd
29°12'34.3"N
94°55'31.0"W
Seashell Beach T2
29°12'35.2"N
94°55'29.7"W
Seashell Beach T3
29°11'08.7"N
94°57'55.5"W
29°11'09.4"N
94°57'54.3"W
Half Moon Beach
& Stavanger Beach
Macrobenthos
Fish

ECOSSYSTEM PROCESSES

BEACH NOURISHMENT

Texas A&M Expert: Storms Worsening State's Beach Erosion Problem

Recent numerous storms and hurricanes have eaten away much of the state's 367-mile coastline

Oct 27, 2020 | By Keith Randall, Texas A&M University Division of Marketing and Communications

An estimated 64 percent of the Texas coast is eroding at an average rate of six feet per year.

National Beach Nourishment Database

About | Log in

Search and Zoom to Features

Zoom to State/County

AK | - All Counties - | Zoom

☐ **USACE Navigation Sediment Placement**

Legend:

- Community Locations

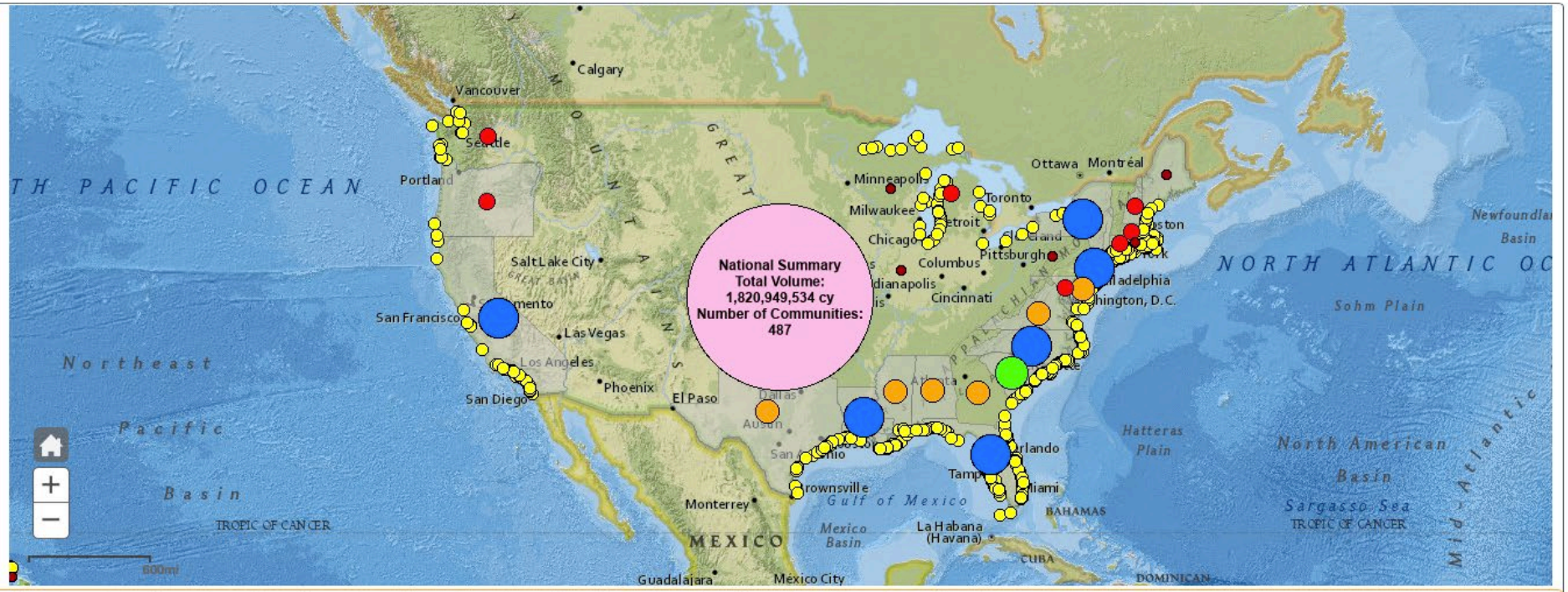
Nourishment Volume:

By State (MCY):

- <1.5
- 1.5 to <15
- 15 to <50
- 50 to <100
- 100 to <700
- >700

By Project (cy):

- Non-USACE Volume
- USACE Volume
- Unknown Volume



▸ Switch Basemap

Enter Password to Export Data | Export

Nationwide | AK | AL | CA | CT | DE | FL | GA | HI | IL | IN | LA | MA | ME | MD | MI | MS | NC | NH | NJ | NY | OH | OR | PA | RI | SC | TX | VA | WA | WI

State	Number of Communities	Number of Nourishment Events	Oldest Event	Newest Event	Known Total Cost	Total Volume (cy)	Known Length (Miles)
FL	83	956	1935	2025	$2,309,244,451	419,094,996	298.2
CA	42	557	1927	2024	$438,376,777	372,188,122	58.4
MA	45	390	1259	2025	$75,642,742	13,203,168	23.0
NC	32	371	1939	2024	$1,258,093,339	182,769,992	102.6
MI	30	337	1979	2024	$86,871,411	10,497,205	2.9
Totals	487	4147			$9,998,299,033	1,820,949,534	1,673.8

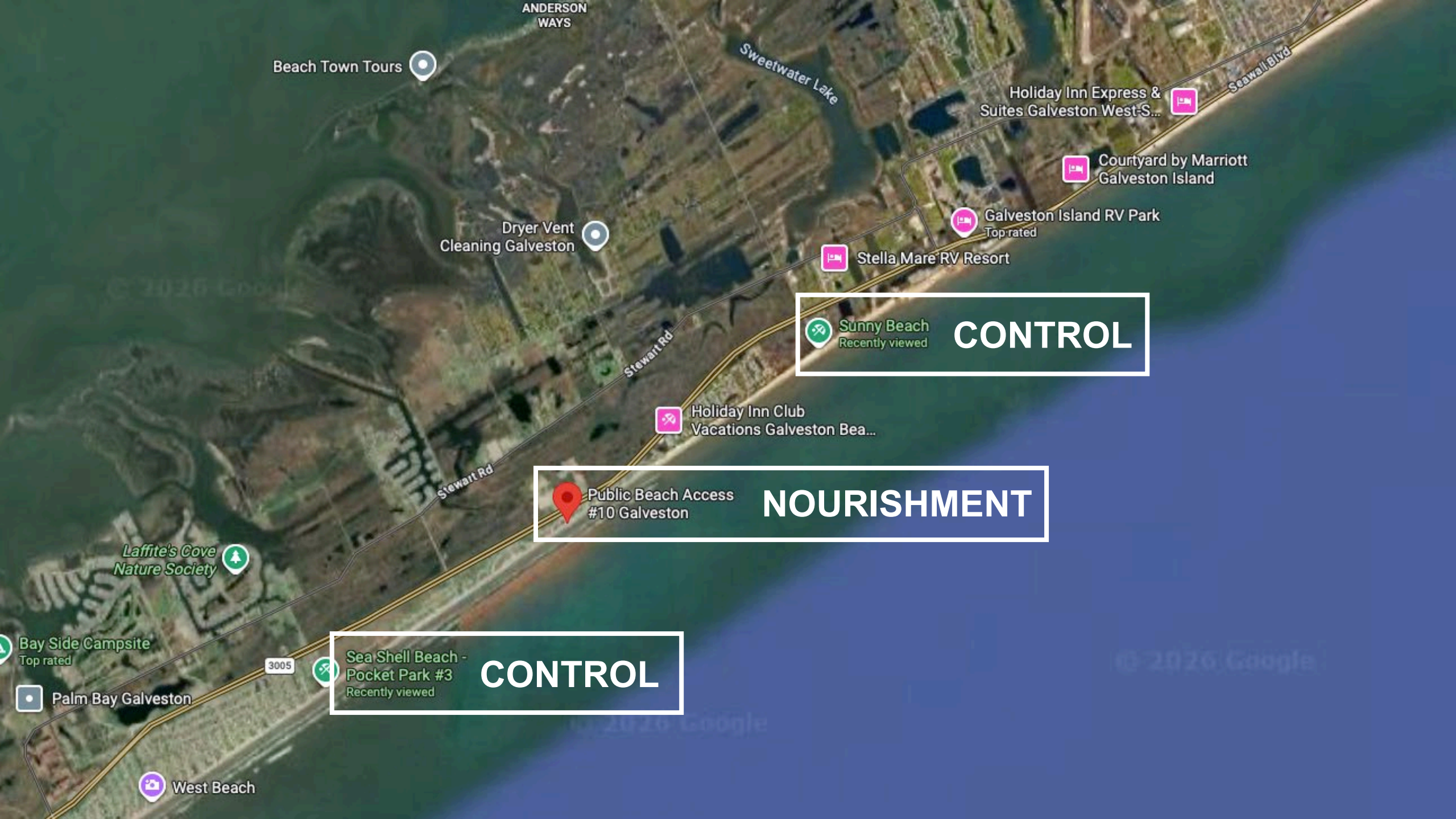
GULF COAST

Massive restoration project closes popular Gulf Coast beach for months

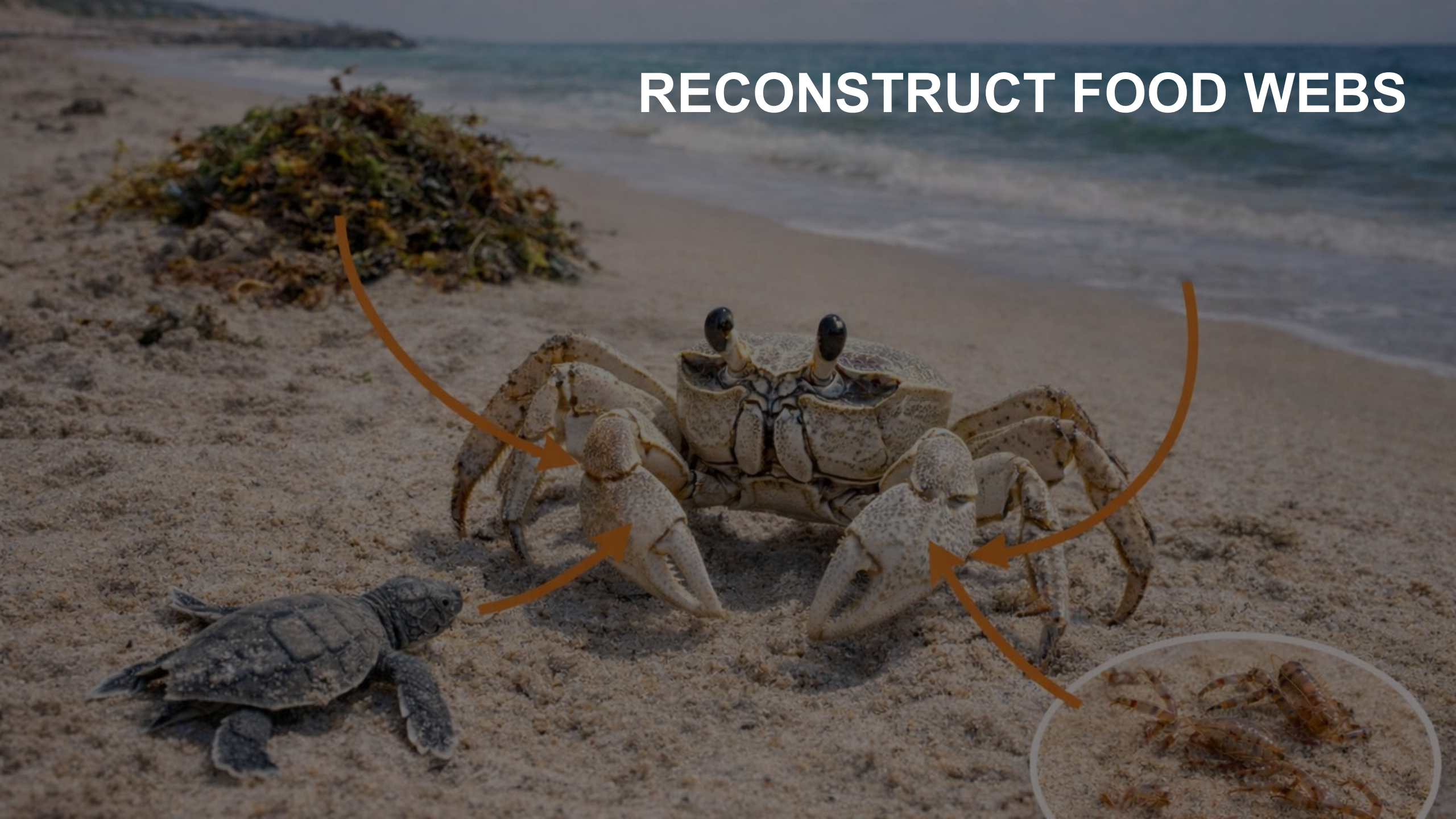
Imagine enough sand to fill one-eighth of New Orleans' Superdome

Bulldozers work on a previous beach restoration project along Galveston's West End, near Dellanera RV Park, in December 2014.
James Nielsen/Houston Chronicle/Getty Images

By **Chris Gray**, *Gulf Coast Reporter* Oct 7, 2025


ANDERSON WAYS
Beach Town Tours
Sweetwater Lake
Seawall Blvd
Holiday Inn Express & Suites Galveston West-S...
Courtyard by Marriott Galveston Island
Galveston Island RV Park
Top rated
Dryer Vent Cleaning Galveston
Stella Mare RV Resort
Sunny Beach
Recently viewed
CONTROL
Stewart Rd
Holiday Inn Club Vacations Galveston Bea...
Public Beach Access #10 Galveston
NOURISHMENT
Laffite's Cove Nature Society
Bay Side Campsite
Top rated
3005
Sea Shell Beach - Pocket Park #3
Recently viewed
CONTROL
Palm Bay Galveston
West Beach

RECONSTRUCT FOOD WEBS



ACKNOWLEDGMENTS

Sandy beach social–ecological systems at risk: regime shifts, collapses, and governance challenges

“Pressures will increase the likelihood of social–ecological collapses and regime shifts, such that beaches will sustain neither the original ecosystem function nor the related services and societal goods and benefits that they provide.”

Sandy beach social–ecological systems at risk: regime shifts, collapses, and governance challenges

"Pressures will increase the likelihood of social–ecological collapses and regime shifts, such that beaches will sustain neither the original ecosystem function nor the related services and societal goods and benefits that they provide (…)

Most people want a beach, but few recognize it as an ecosystem at risk."

Defeo et al. (2021) *Front. Ecol. Evol.*

TEXAS A&M UNIVERSITY
GALVESTON CAMPUS.

Dr. Guilherme Corte
Benthic Ecology Lab
corte@tamug.edu